CUMMINGS
RITER
CONSULTANTS, INC.

March 12, 2012
Project No. 360.20/01

Mr. Russell H. Fish
Office of Remediation 3LC20
U.S. Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103-2029

Copy entire Rpt
except Appendix A

**RE: INTERIM REMEDIAL MEASURE ALTERNATIVES ASSESSMENT
UPSTREAM PORTION OF THE SLUICEWAY
DELAWARE VALLEY WORKS FACILITY – CLAYMONT, DELAWARE
USEPA I.D. NOS. DED154576698 AND PAD990823742
DOCKET NO. RCRA—3-089CA**

Dear Mr. Fish:

On behalf of General Chemical Corporation and Honeywell International Inc., enclosed are three copies of the updated Interim Remedial Measure Alternatives Assessment Report for the upstream portion of the sluiceway, being submitted in response to your letter to Mr. Michael Ware of General Chemical LLC, dated February 8, 2012.

Please feel free to call me at (412) 241-4500 if you have questions.

Respectfully submitted,
Cummings/Riter Consultants, Inc.

Patrick F. O'Hara, P.E.
President

PFO/dat
Enclosures

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UPSTREAM PORTION OF THE SLUICEWAY
DELAWARE VALLEY WORKS FACILITY
CLAYMONT, DELAWARE
USEPA ID NOS. DED154576698 AND PAD990823742
DOCKET NO. RCRA-3-089CA

PREPARED FOR:

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MARCH 12, 2012

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1.0 INTRODUCTION

Cummings/Riter Consultants, Inc. (Cummings Riter) has prepared this Interim Remedial Measure (IRM) Alternatives Assessment for the upstream segment of the sluiceway at the Delaware Valley Works Facility (the Facility) located in Claymont, Delaware, on behalf of General Chemical LLC (General Chemical) (formerly General Chemical Corporation) and Honeywell International Inc. This assessment was initiated in response to a request from the U.S. Environmental Protection Agency (USEPA) dated April 4, 2011 which documented a USEPA concern regarding the presence of pesticides (dichlorodiphenyltrichloroethane [DDT], dichlorodiphenyldichloroethane [DDD], dichlorodiphenyldichloroethylene [DDE]), arsenic, and lead in sediment samples collected from the storm water sewer system at the Facility (including the sluiceway), and near-shore area of the Delaware River contiguous to the Facility. Cummings/Riter prepared a report documenting an alternatives assessment for these portions of the Facility which was submitted to USEPA on May 9, 2011. The report evaluated alternatives for the shoreline, river sediment, and the storm water piping system, and partially evaluated alternatives for the sluiceway. A preferred alternative(s) was not identified for the sluiceway due to data gaps regarding physical conditions. A letter describing the collection of data needed to close this data gap and to complete the alternatives assessment for the sluiceway (and a schedule for these activities) was submitted to USEPA on July 14, 2011. This IRM Alternatives Assessment is being submitted pursuant to the July 14, 2011 letter, and presents the completion of the alternatives assessment for the upper portion of the sluiceway, defined as the portion upstream of the existing weir structure. The initial version of this report was submitted to USEPA on October 31, 2011. USEPA provided comments to that submittal in a letter dated February 8, 2012. This report has been modified in response to the USEPA comment letter.

1.1 SITE BACKGROUND

The Facility includes a North Plant and a South Plant, which are separated by U.S. Highway 13, located in Claymont, Delaware. Storm water at the North Plant is collected by a storm water sewer collection system. This system conveys storm water by gravity beneath U.S. Highway 13 and into the storm water sewer system that serves the South Plant. Storm water in the South Plant system flows into a confluence box where sediment deposition takes place. From the confluence box, storm water is conveyed by gravity to the sluiceway, where it then enters a lift station upstream of a weir, and passes through the Facility's water treatment system. The treated water is then discharged downstream of the weir, which conveys the treated storm water flow to the Delaware River. The IRM alternatives assessed in this report pertain to the portion of the sluiceway upstream of this weir. The alternatives assessment for the balance of the sluiceway will be addressed in a forthcoming report.

As described above, sediment conveyed in the Facility's storm water system is trapped at various points throughout this system. Samples of this sediment have been collected and analyzed, disclosing the presence of pesticides, arsenic, and lead. Sediment has also been sampled and analyzed from near-shore areas of the Delaware River adjacent to the Facility. Figure 1 shows the layout of the storm water collection systems. Figure 2 shows recent results from sediment sampling for the North Plant and South Plant. Figure 3 shows the results of sediment sampling and analysis. Information shown on Figures 1, 2, and 3 has previously been submitted to USEPA.

1.2 BASIS FOR IRMS

USEPA has determined that the presence of pesticides, arsenic, and lead in sediment constitutes a potential threat to human health and the environment that is related to the Facility, and is subject to a Final Administrative Order (the Order) for Corrective Action (Docket Resource Conservation and Recovery Act [RCRA]-3-089CA). Under the terms of that Order, USEPA has requested that General Chemical prepare an Interim Measures Work Plan pursuant to Section VI.A.3 of the Order to address the potential threat. Prior to the development of the Interim Measures Work Plan, USEPA requested that General

Chemical prepare and submit an evaluation of IRM alternatives for potential implementation. This report addresses the assessment of alternatives for the portion of the sluiceway upstream of the weir.

1.3 Objectives of Alternatives

The objectives for the IRM alternatives are as follows:

- Control the release of source material into the storm water sewer system and the Delaware River, and
- Address the contamination in the Delaware River sediments in the near-shore areas adjacent to the Facility and the storm water sewer system of the Facility, including the sluiceway.

1.4 Criteria for Evaluating Alternatives

Criteria for assessing IRM alternatives were discussed during telephone conversations with Mr. Russell Fish of USEPA during the preparation of the May 9, 2011 report, as updated in USEPA's June 21, 2011 letter to General Chemical. An alternatives assessment for the upstream portion of the sluiceway reflecting those discussions is presented in the following sections. The removal of sediment from the storm sewer system upstream of the sluiceway was described in the May 9, 2011 report, has been completed.

Section 2.0 describes the investigation of the geotechnical and topographic conditions of the upper sluiceway. The evaluation of alternatives for the upper portion of the sluiceway is described in Section 3.0, where each alternative is described and evaluated relative to one another with respect to 1) effectiveness in meeting the objectives of protecting human health and the environment; 2) potential risks associated with implementation; 3) feasibility of implementation; 4) relative cost; and 5) as required in the June 21, 2011 USEPA letter, permanence, including complexity and cost of maintenance. Subsection 3.7 presents the proposed alternative. Section 4.0 discusses the underground portion of the sluiceway that conveys stormwater beneath the railroad tracks, and Section 5.0 presents the implementation sequence.

2.0 INVESTIGATION OF CONDITIONS IN THE UPPER SLUICEWAY

The sluiceway is comprised of distinct segments that warrant specific consideration in evaluating alternatives for IRMs. While the levels of pesticides, lead, and arsenic in sluiceway sediments are reasonably well understood, the topographic and physical conditions of the sluiceway and surrounding sediment and soils were not well understood at the time of the May 9, 2011 alternatives assessment. The report included a partial evaluation of alternatives, but identified data gaps regarding topographic and geotechnical conditions that needed to be resolved before an alternatives analysis could be completed for the sluiceway. The June 21, 2011 letter from USEPA to General Chemical requested a schedule for performing investigations to obtain the data necessary to complete the evaluation of alternatives for the sluiceway. Cummings/Riter provided the scope and schedule for performing these investigations to USEPA in a letter dated July 14, 2011.

2.1 UNDERGROUND PORTION OF THE SLUICEWAY BENEATH THE RAILROAD TRACKS

The uppermost portion of the sluiceway conveys storm water flows underground from the confluence box to the open section of the sluiceway. Recently obtained photographs show that some walls of the underground portion are comprised of concrete block and the base is comprised of poured concrete. A recent photo taken from a manhole opening is included as Appendix A. Additionally, drawings depicting the construction of the underground portion of the sluiceway have recently been located and are being reviewed. The amount and physical nature of sediment currently located in this section of the sluiceway has not been quantified, but given the nature of construction on this section, physical removal of the sediment in this section is anticipated to be the sole practical interim measure that would enable attainment of project objectives. Section 4.0 describes the remedial approach for this area.

2.2 OPEN SECTIONS OF THE SLUICEWAY

Geotechnical investigations and topographic surveying of the sluiceway (along with assessment of near-shore areas of the Delaware River and shoreline being addressed by the interim measures) were conducted during September 2011. The geotechnical and topographic data are presented in their entirety in the alternatives assessment for the portions of the sluiceway downstream of the weir, which was submitted in November 2011. The data from the geotechnical investigation pertaining to the upper portion of the sluiceway are provided in Appendix B. The topographic information that pertains to the upper portion of the sluiceway is provided in Appendix C.

As noted in Appendix B, the geotechnical investigation identified the presence of soft sediment in a majority (four of five) of the locations tested in the upper portions of the sluiceway at thicknesses ranging from approximately 1 to 5 feet, with a representative thickness of approximately 1.5 feet. The thickness of soft sediment at the H-41 location was found to be approximately 5 feet (Appendix B).

The peak undrained shear strength in this sediment was found to be 7 to 350 pounds per square foot (psf) (negligible to approximately 2.4 pounds per square inch (psi). The remolded undrained shear strength of this sediment ranges from less than 2 to 140 psf (negligible to approximately 1 psi). This soft sediment was found to be underlain a dense gravel layer or gravel mixed with sand and clay that forms the base of the sluiceway channel bottom.

Cross-sections located in the portions of the sluiceway that are the subject of this report are provided in Appendix C. The cross-sections depict the longitudinal and transverse geometry of the upper portion of the sluiceway, and will enable calculation of material quantities and confirmation of hydraulic capacity during the design of the selected alternative.

The most important information relevant to alternatives assessment and selection disclosed by these investigations is the identification of locations, thickness, and shear strengths of soft sediment. The prevalence and lack of shear strength of soft sediment overlying a gravel channel bottom in this portion of the sluiceway is an important consideration in alternatives assessment.

3.0 ALTERNATIVES ASSESSMENT – UPPER PORTION OF THE SLUICEWAY

Cummings/Riter has identified the following potentially applicable alternatives for achieving the objectives for the open (aboveground) sections of the upper sluiceway IRM:

1. **Alternative 1 – In-Place Physical Stabilization:** This alternative involves in-situ physical stabilization and isolation of sediment using engineered geotextile, and securing/maintaining the flow channel with riprap or an articulated concrete lining, or alternate equivalent non-porous media to be determined during design.

2. **Alternative 2 – Pipeline Conveyance:** This alternative involves placement of a new large-diameter storm water conveyance pipe in the sluiceway, and securing the surrounding sediment with filter fabric and engineered backfill such that flow capacity is maintained while the sediment is isolated from storm water and buried.

3. **Alternative 3 – Sediment Removal and Physical Stabilization:** This alternative involves removal of impacted soft sediment for off-site disposal. This alternative would also include physical stabilization of remaining sediment (if any) to offer environmental isolation, and reestablishment of a stable storm water flow channel using engineered geotextile and securing/managing the flow channel as described above for Alternative 1. The specific type of physical stabilization may involve placement of amended material (such as low permeability media, or equivalent material, or placement of engineered geofabric products), the details of which will be determined during engineering design.

An assessment of these alternatives using the evaluation criteria is provided below.

3.1 EFFECTIVENESS IN MEETING THE IRM OBJECTIVES IN PROTECTING HUMAN HEALTH AND THE ENVIRONMENT

Each of the three alternatives evaluated for the sluiceway, if appropriately implemented, could be acceptable under this criterion. Alternatives 1 and 2 (stabilization in place with different means of maintaining storm water conveyance) would be effective at locations where the stabilized sediments and surrounding soils have the physical strength to support either an open-lined flow channel or large-diameter pipe for storm water conveyance. However, the geotechnical investigation disclosed that sediment with very low strength exists in four of the five locations evaluated for the upper portion of the sluiceway. Alternative 3 (soft sediment removal followed by stabilization of any residual sediment and providing a lined storm water channel) would be able to meet this criterion throughout the upper sluiceway.

3.2 POTENTIAL RISKS OF IMPLEMENTATION

The potential risks of implementation are similar for these three alternatives. All three alternatives would utilize flow diversion such that work is conducted in relatively dry conditions, with appropriate control of potential sediment mobilization. For all three alternatives, flow diversion must be undertaken in a manner that maintains compliance with federal, state, and local regulations including the terms and conditions of the existing National Pollutant Discharge Elimination System (NPDES) permit for the sluiceway discharge. Flow may include storm water, as well as some groundwater that could, under some circumstances, flow into the work zone under any of the alternatives. All three alternatives involve some disturbance of impacted materials. Alternatives 1 and 2 would be very challenging to implement due to the likely inability of soft sediment to support construction equipment (Appendix B). Relative to Alternatives 1 and 2, Alternative 3 involves greater implementation risks associated with the sediment removal, transportation, and disposal of impacted materials, including the potential for direct exposure of workers to contaminated sediments, potential for releases during on-site processing of sediments, and potential off-site releases associated with transportation-related spills and accidents. This work under Alternative 3 will require making appropriate waste determinations, as well as ensuring that all activities associated with this IRM comply with all federal, state, and local regulations.

3.3 FEASIBILITY OF IMPLEMENTATION

Implementation of all three alternatives is feasible, but relative ease or difficulty of implementation would vary significantly with the actual physical conditions of soils/sediment encountered. The stabilization in-place alternatives (Alternatives 1 and 2) would be feasible for conditions where the sediments have sufficient physical integrity to support either a channel lining or large-diameter conveyance pipe, but only one of the five locations evaluated appears to fit this criteria. Alternative 3 is better suited to areas where the underlying materials are very soft, which includes four of the five locations evaluated. Additionally, given that the Upper Sluiceway contains a well defined and limited amount of soft sediment (i.e., a controlled volume), Alternative 3 ranks highly under this criterion.

3.4 RELATIVE COST (CAPITAL)

This criterion considers the cost of design and construction for each alternative. Alternative 3 will likely be more costly to construct than Alternative 1, given that Alternative 3 has the additional cost components of sediment removal, transportation, and disposal. Interim measures undertaken for the confluence box have found that the sediment removed is a non-hazardous waste that upon stabilization, and can be disposed of in an RCRA Subtitle D landfill. The relative cost of Alternative 2, as compared to the other two alternatives, is dependent on the volume and unit cost of pipe backfill material that would be disclosed in the design should this alternative be selected. However, given the amount of imported backfill needed to fully secure the conveyance pipe, Alternative 2 would be anticipated to be the highest capital cost alternative.

3.5 PERMANENCE, INCLUDING MAINTENANCE REQUIREMENTS AND COSTS OVER TIME

Alternative 1 ranks poorest under this criterion, in that all of the impacted, very soft sediment would remain on site within the sluiceway channel. The channel would likely require periodic inspection to assure that the containment of sediment after major storm events is still maintained. Costs of future maintenance work could prove significant. Alternative 2 ranks better under this criterion, as the buried pipeline would provide additional integrity in maintaining the buried sediment in place.

Alternative 3 ranks highest under this criterion, as soft, potentially mobile sediment is removed from the site, and provides for a solid base for a new stabilized channel. Alternative 3 would reduce both the need for future inspections and the complexity and resultant costs of any needed future repairs as compared to Alternatives 1 and 2.

3.6 Discussion of Alternatives Assessment Based on Geotechnical Considerations

As described in Appendix B, soft sediments were encountered at the five locations assessed in the upper portion of the sluiceway. In some cases, the remolded strength of the sediments is low enough that it could not be measured using the Vane Sheer Test (VST). Some observations from review of the geotechnical data obtained in September 2011 (Appendix B) include the following:

- Surface sediments may be sensitive to disturbance. For alternatives that include sediment removal, typical sediment excavation would employ conventional small earthwork equipment staged inside of the sluiceway after it has been dewatered. This equipment would be used to excavate and move the sediment to a location where an excavator located outside of the sluiceway could remove the sediment, dewater the sediment on site, and load it onto trucks for off-site disposal. It is possible for recently deposited sediments, such as those found in the sluiceway, to lose significant strength upon disturbance. This is referred to as "sensitive" behavior. The design of the interim measure for this portion of the sluiceway will need to address these sensitive conditions, and anticipate that sediments might "run" to a flatter angle of repose during excavation activities. Measures typically taken to counter this effect include utilizing specialized removal equipment (e.g., vacuum removal).

- Surface sediments likely will not directly be able to support typical construction loads. An approach, such as excavating from outside the sluiceway to create a working surface on the stiffer underlying sediments, may be one way to manage the soft surface conditions. This working surface could be an area to stage equipment within the sluiceway, or a starting point for equipment to be used to excavate sediments from within the sluiceway. Alternate approaches, such as low ground-pressure equipment, may also need to be considered to manage soft surface conditions.

- An engineered cap or newly installed large-diameter conveyance pipe may not be implementable in the sluiceway without removal of underlying soft sediment. These types of water conveyance structures should be designed to be stable under a variety of flow regimes. The ability to maintain physical integrity of a water conveyance structure over time under widely varying flows would be more readily assured by the removal of soft sediment.

3.7 RECOMMENDED ALTERNATIVE (ABOVEGROUND PORTION)

Based on the comparative analysis described in Subsections 3.1 through 3.6, summarized in Table 3.1, Alternative 3 is the recommended alternative. Alternative 3 removes soft sediment from the sluiceway to the extent practicable with conventional equipment, while not damaging the sidewalls of the sluiceway, enabling the reconstruction of a stable channel to convey future storm flows. The removal of this material under this alternative has the added benefit of removing a substantial volume of environmentally impacted material from the site, with associated benefits of reduced long-term maintenance, complexity, and costs. Any residual contaminants would be contained beneath an engineered channel lining. The specifications for the channel lining will be determined during the design.

4.0 UNDERGROUND PORTION OF THE SLUICEWAY

Sampling and testing have disclosed the presence of impacted sediment in the storm water sewer system at both the North Plant and the downstream South Plant. The only practical alternative to eliminate the potential of these sediments to migrate downstream to the shoreline areas (without eliminating the sewer systems, which is infeasible) was to remove the sediment from the sewers, manholes, inlets, etc., using standard sewer maintenance approaches. This alternative for the storm water sewer system was described and recommended in the approved May 9, 2011 alternatives evaluation report.

Similar to the upstream portions of the storm water sewer system, the only practically implementable alternative for the underground portion of the upper sluiceway is physical removal of the sediment. Cummings/Riter has, therefore, not attempted to conduct a ranking of other multiple alternatives for the underground portions of the sluiceway. The information recently obtained regarding the underground portion of the sluiceway indicates that it is likely to be structurally sound enough to safely accommodate sediment removal, subject to inspections and confirmation by the selected contractor.

The work would be conducted by a qualified contractor on a performance basis. The selected contractor would assess the underground portion of the sluiceway with respect to the goal of sediment removal, and then develop work procedures he would intend to employ. This would include procedures for the proper management, treatment, and discharge of storm water or groundwater encountered in performing this work. The contractor's work procedures would be available for review by USEPA prior to initiation of removal work. The work procedures will be required to properly address confined space entry, as appropriate to the work procedures. One possible technique could be the use of a vacuum truck, with manual entry to the underground work area under a confined space entry permit. Other approaches, including jetting, may also be proposed. Flow diversion and groundwater management, if required, would be undertaken in a manner that maintains compliance with federal, state, and local regulations including the terms and conditions of the existing NPDES permit for the sluiceway discharge.

The management of removed liquids and solids will be appropriately conducted to reflect their constituents. The removed sediment would then be characterized for disposal and disposed of off site at permitted facilities. Any liquids collected will likely be pre-treated on site for subsequent discharge to the storm water treatment system, or otherwise properly managed in accordance with the contractor's procedures and applicable laws, regulation and permits.

Photography will be employed to document sediment removal. Finally, this work will be completed prior to any work proceeds to the downstream portion of the upper sluiceway.

5.0 UPDATE OF ALTERNATIVES SELECTION AND SEQUENCE OF INTERIM REMEDIAL MEASURES

Based on the site layout and potential migration pathways, a specific sequence of activities was recommended in the May 9, 2011 Alternatives Assessment Report for the IRMs to address USEPA's stated objectives. The sequence has been reviewed and updated, as described below.

The recommended sequence is as follows:

1. Complete the removal and disposal of sediment from the storm water sewer systems at both the North Plant and South Plant. **(Complete.)**

2. Select the alternative for river and shoreline sediments. The alternative recommended is secured containment using armored capping or a rock cap. **(Complete.)**

3. Determine remediation criteria for river shoreline and near-shore sediments. **(In progress.)**

4. Conduct further field investigation of the conditions in the sluiceway. **Completed work relevant to the upper portion of the sluiceway is described in this report.** The results of this work enable selection of the alternative(s) and design of the remedy for the sluiceway.

5. Determine the selected alternative for the upper portion of the sluiceway. **(In progress and the subject of this report.)**

6. Plan design, and undertake the selected alternative for the upper portion of the sluiceway, starting with the underground portion of the sluiceway. **(2012)**

7. Evaluate alternatives for the lower portion of the sluiceway. Select preferred alternative. **(In progress)**

8. Interim Measures (IM) Work Plan, under which both the design and permitting of the shoreline sediment and lower sluiceway IRM would be initiated. **(Requires Step 3 [above] to be completed.)**

9. Implement the alternative for the lower sluiceway and shoreline sediment. **(Schedule will be provided in the IM Work Plan.)**

This sequence results in multiple activities being undertaken in parallel towards USEPA's objectives, but also results in a logical "upstream to downstream" sequence of actual implementation, such that upstream sources are addressed prior to implementing the downstream interim measures.

TABLE

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TABLE 3-1
RELATIVE RANKING[a]
ALTERNATIVES EVALUATION CRITERIA
UPPER PORTION OF SLUICEWAY

EVALUATION CRITERIA	ALTERNATIVE 1 (IN-PLACE STABILIZATION)	ALTERNATIVE 2 (PIPELINE CONVEYANCE)	ALTERNATIVE 3 (SOFT SEDIMENT REMOVAL AND CHANNEL STABILIZATION)
1. Effectiveness in meeting IRM objectives in protecting human health and the environment.	1	2	3
2. Potential risk of implementation.	2 [b]	2	1
3. Feasibility of implementation.	2	2	3
4. Relative cost (capital).	3	1	2
5. Permanence, including maintenance costs over time.	1	2	3
TOTAL SCORE	9	9	12

[a] The ranking of alternatives for each criterion ranges from 1 to 3, with 3 indicating that the alternative best satisfies that criterion.
[b] If relative ranking between alternatives is equal, both alternatives are assigned the same number.

FIGURES

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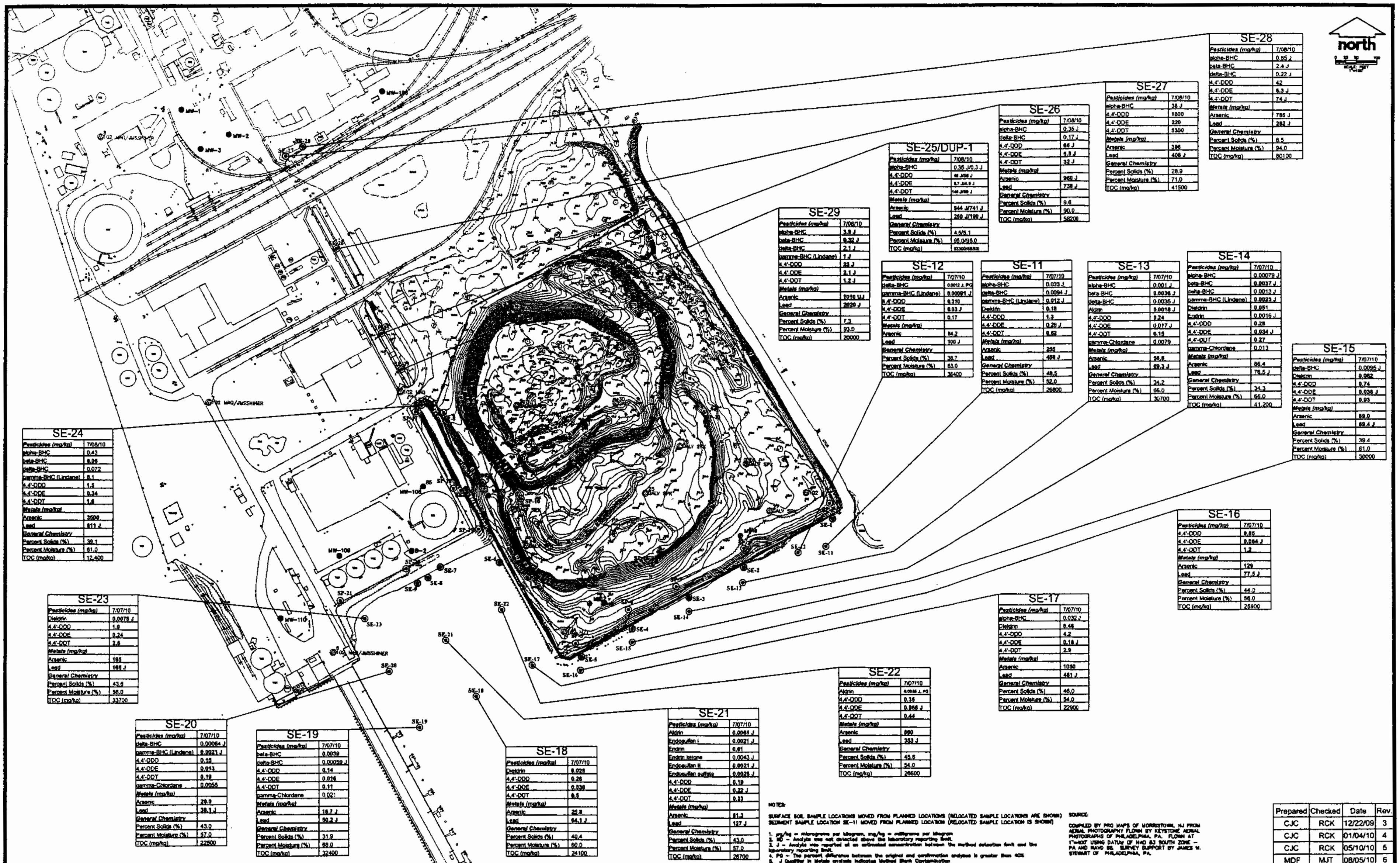


SE-28	
Pesticides (mg/kg)	7/08/10
alpha-BHC	0.85 J
beta-BHC	2.4 J
delta-BHC	0.22 J
4,4'-DDD	42
4,4'-DDE	6.3 J
4,4'-DDT	74 J
Metals (mg/kg)	
Arsenic	785 J
Lead	282 J
General Chemistry	
Percent Solids (%)	6.5
Percent Moisture (%)	94.0
TOC (mg/kg)	80100

SE-27	
Pesticides (mg/kg)	7/08/10
alpha-BHC	38 J
4,4'-DDD	1800
4,4'-DDE	220
4,4'-DDT	5300
Metals (mg/kg)	
Arsenic	396
Lead	408 J
General Chemistry	
Percent Solids (%)	28.9
Percent Moisture (%)	71.0
TOC (mg/kg)	41500

SE-26	
Pesticides (mg/kg)	7/08/10
alpha-BHC	0.35 J
delta-BHC	0.17 J
4,4'-DDD	66 J
4,4'-DDE	5.8 J
4,4'-DDT	32 J
Metals (mg/kg)	
Arsenic	960 J
Lead	738 J
General Chemistry	
Percent Solids (%)	9.6
Percent Moisture (%)	90.0
TOC (mg/kg)	58200

SE-25/DUP-1	
Pesticides (mg/kg)	7/08/10
alpha-BHC	0.35 J/0.3 J
4,4'-DDD	46 J/56 J
4,4'-DDE	5.7 J/4.5 J
4,4'-DDT	140 J/90 J
Metals (mg/kg)	
Arsenic	944 J/741 J
Lead	260 J/190 J
General Chemistry	
Percent Solids (%)	4.5/5.1
Percent Moisture (%)	95.0/95.0
TOC (mg/kg)	93300/68500

SE-29	
Pesticides (mg/kg)	7/08/10
alpha-BHC	3.9 J
beta-BHC	0.32 J
delta-BHC	2.1 J
gamma-BHC (Lindane)	1 J
4,4'-DDD	23 J
4,4'-DDE	2.1 J
4,4'-DDT	1.2 J
Metals (mg/kg)	
Arsenic	1010 UJ
Lead	2020 J
General Chemistry	
Percent Solids (%)	7.3
Percent Moisture (%)	93.0
TOC (mg/kg)	20000

SE-12	
Pesticides (mg/kg)	7/07/10
delta-BHC	0.0012 J, PG
gamma-BHC (Lindane)	0.00091 J
4,4'-DDD	0.310
4,4'-DDE	0.03 J
4,4'-DDT	0.17
Metals (mg/kg)	
Arsenic	84.2
Lead	100 J
General Chemistry	
Percent Solids (%)	38.7
Percent Moisture (%)	63.0
TOC (mg/kg)	36400

SE-11	
Pesticides (mg/kg)	7/07/10
alpha-BHC	0.033 J
delta-BHC	0.0094 J
gamma-BHC (Lindane)	0.012 J
Dieldrin	0.18
4,4'-DDD	1.3
4,4'-DDE	0.29 J
4,4'-DDT	0.62
Metals (mg/kg)	
Arsenic	255
Lead	489 J
General Chemistry	
Percent Solids (%)	48.5
Percent Moisture (%)	52.0
TOC (mg/kg)	26800

SE-13	
Pesticides (mg/kg)	7/07/10
alpha-BHC	0.001 J
beta-BHC	0.0036 J
delta-BHC	0.0035 J
Aldrin	0.0018 J
4,4'-DDD	0.24
4,4'-DDE	0.017 J
4,4'-DDT	0.15
gamma-Chlordane	0.0079
Metals (mg/kg)	
Arsenic	56.6
Lead	69.3 J
General Chemistry	
Percent Solids (%)	34.2
Percent Moisture (%)	66.0
TOC (mg/kg)	30700

SE-14	
Pesticides (mg/kg)	7/07/10
alpha-BHC	0.00079 J
beta-BHC	0.0037 J
delta-BHC	0.0013 J
gamma-BHC (Lindane)	0.0023 J
Dieldrin	0.051
Endrin	0.0016 J
4,4'-DDD	0.28
4,4'-DDE	0.034 J
4,4'-DDT	0.27
gamma-Chlordane	0.013
Metals (mg/kg)	
Arsenic	86.4
Lead	76.5 J
General Chemistry	
Percent Solids (%)	34.3
Percent Moisture (%)	66.0
TOC (mg/kg)	41,200

SE-15	
Pesticides (mg/kg)	7/07/10
delta-BHC	0.0095 J
Dieldrin	0.062
4,4'-DDD	0.74
4,4'-DDE	0.038 J
4,4'-DDT	0.93
Metals (mg/kg)	
Arsenic	89.0
Lead	89.4 J
General Chemistry	
Percent Solids (%)	39.4
Percent Moisture (%)	61.0
TOC (mg/kg)	30000

SE-24	
Pesticides (mg/kg)	7/08/10
alpha-BHC	0.43
beta-BHC	0.08
delta-BHC	0.072
gamma-BHC (Lindane)	0.1
4,4'-DDD	1.5
4,4'-DDE	0.34
4,4'-DDT	1.6
Metals (mg/kg)	
Arsenic	3500
Lead	811 J
General Chemistry	
Percent Solids (%)	39.1
Percent Moisture (%)	61.0
TOC (mg/kg)	12,400

SE-16	
Pesticides (mg/kg)	7/07/10
4,4'-DDD	0.85
4,4'-DDE	0.064 J
4,4'-DDT	1.2
Metals (mg/kg)	
Arsenic	129
Lead	77.5 J
General Chemistry	
Percent Solids (%)	44.0
Percent Moisture (%)	56.0
TOC (mg/kg)	25900

SE-23	
Pesticides (mg/kg)	7/07/10
Dieldrin	0.0078 J
4,4'-DDD	1.9
4,4'-DDE	0.24
4,4'-DDT	2.6
Metals (mg/kg)	
Arsenic	165
Lead	166 J
General Chemistry	
Percent Solids (%)	43.6
Percent Moisture (%)	56.0
TOC (mg/kg)	33700

SE-17	
Pesticides (mg/kg)	7/07/10
alpha-BHC	0.032 J
Dieldrin	0.46
4,4'-DDD	4.2
4,4'-DDE	0.18 J
4,4'-DDT	2.9
Metals (mg/kg)	
Arsenic	1050
Lead	481 J
General Chemistry	
Percent Solids (%)	46.0
Percent Moisture (%)	54.0
TOC (mg/kg)	22900

SE-22	
Pesticides (mg/kg)	7/07/10
Aldrin	0.0046 J, PG
4,4'-DDD	0.35
4,4'-DDE	0.058 J
4,4'-DDT	0.44
Metals (mg/kg)	
Arsenic	989
Lead	353 J
General Chemistry	
Percent Solids (%)	45.6
Percent Moisture (%)	54.0
TOC (mg/kg)	26600

SE-21	
Pesticides (mg/kg)	7/07/10
Aldrin	0.0061 J
Endosulfan I	0.0021 J
Endrin	0.01
Endrin ketone	0.0043 J
Endosulfan II	0.0021 J
Endosulfan sulfate	0.0026 J
4,4'-DDD	0.19
4,4'-DDE	0.22 J
4,4'-DDT	0.23
Metals (mg/kg)	
Arsenic	81.2
Lead	127 J
General Chemistry	
Percent Solids (%)	43.0
Percent Moisture (%)	57.0
TOC (mg/kg)	26700

SE-20	
Pesticides (mg/kg)	7/07/10
delta-BHC	0.00064 J
gamma-BHC (Lindane)	0.0021 J
4,4'-DDD	0.15
4,4'-DDE	0.013
4,4'-DDT	0.19
gamma-Chlordane	0.0056
Metals (mg/kg)	
Arsenic	20.0
Lead	38.1 J
General Chemistry	
Percent Solids (%)	43.0
Percent Moisture (%)	57.0
TOC (mg/kg)	22500

SE-19	
Pesticides (mg/kg)	7/07/10
beta-BHC	0.0039
delta-BHC	0.00059 J
4,4'-DDD	0.14
4,4'-DDE	0.016
4,4'-DDT	0.11
gamma-Chlordane	0.021
Metals (mg/kg)	
Arsenic	16.7 J
Lead	50.2 J
General Chemistry	
Percent Solids (%)	31.9
Percent Moisture (%)	68.0
TOC (mg/kg)	32400

SE-18	
Pesticides (mg/kg)	7/07/10
Dieldrin	0.028
4,4'-DDD	0.26
4,4'-DDE	0.038
4,4'-DDT	0.5
Metals (mg/kg)	
Arsenic	25.8
Lead	64.1 J
General Chemistry	
Percent Solids (%)	40.4
Percent Moisture (%)	60.0
TOC (mg/kg)	24100

NOTES:

SURFACE SOIL SAMPLE LOCATIONS MOVED FROM PLANNED LOCATIONS (RELOCATED SAMPLE LOCATIONS ARE SHOWN)
SEDIMENT SAMPLE LOCATION SE-11 MOVED FROM PLANNED LOCATION (RELOCATED SAMPLE LOCATION IS SHOWN)

1. µg/kg = micrograms per kilogram, mg/kg = milligrams per kilogram
2. ND – Analyte was not detected above the laboratory reporting limit.
3. J – Analyte was reported at an estimated concentration between the method detection limit and the laboratory reporting limit.
4. PG – The percent difference between the original and confirmation analyses is greater than 40%
5. J Qualifier in Metals analysis indicates Method Blank Contamination

SOURCE:

COMPILED BY PRO MAPS OF MORRISTOWN, NJ FROM AERIAL PHOTOGRAPHY FLOWN BY KEYSTONE AERIAL PHOTOGRAPHS OF PHILADELPHIA, PA. FLOWN AT 1"=400' USING DATUM OF NAD 83 SOUTH ZONE – PA AND NAVD 88. SURVEY SUPPORT BY JAMES M. STEWART OF PHILADELPHIA, PA.

Prepared	Checked	Date	Rev.
CJC	RCK	12/22/09	3
CJC	RCK	01/04/10	4
CJC	RCK	05/10/10	5
MDF	MJT	08/05/10	6

LEGEND

- APPROXIMATE EXTENT OF SOLID WASTE MANAGEMENT UNIT (SWMU)
- EXISTING MONITORING WELLS
- SP-1: JULY 2010 SURFACE SOIL SAMPLE LOCATION– ANALYZED FOR PESTICIDES, ARSENIC AND LEAD.
- SE-1: EXISTING DELAWARE RIVER SEDIMENT SAMPLE LOCATION – ANALYZED FOR DDX, ARSENIC AND LEAD.
- SE-11: JULY 2010 SEDIMENT SAMPLE LOCATION – ANALYZED FOR PESTICIDES, ARSENIC AND LEAD.

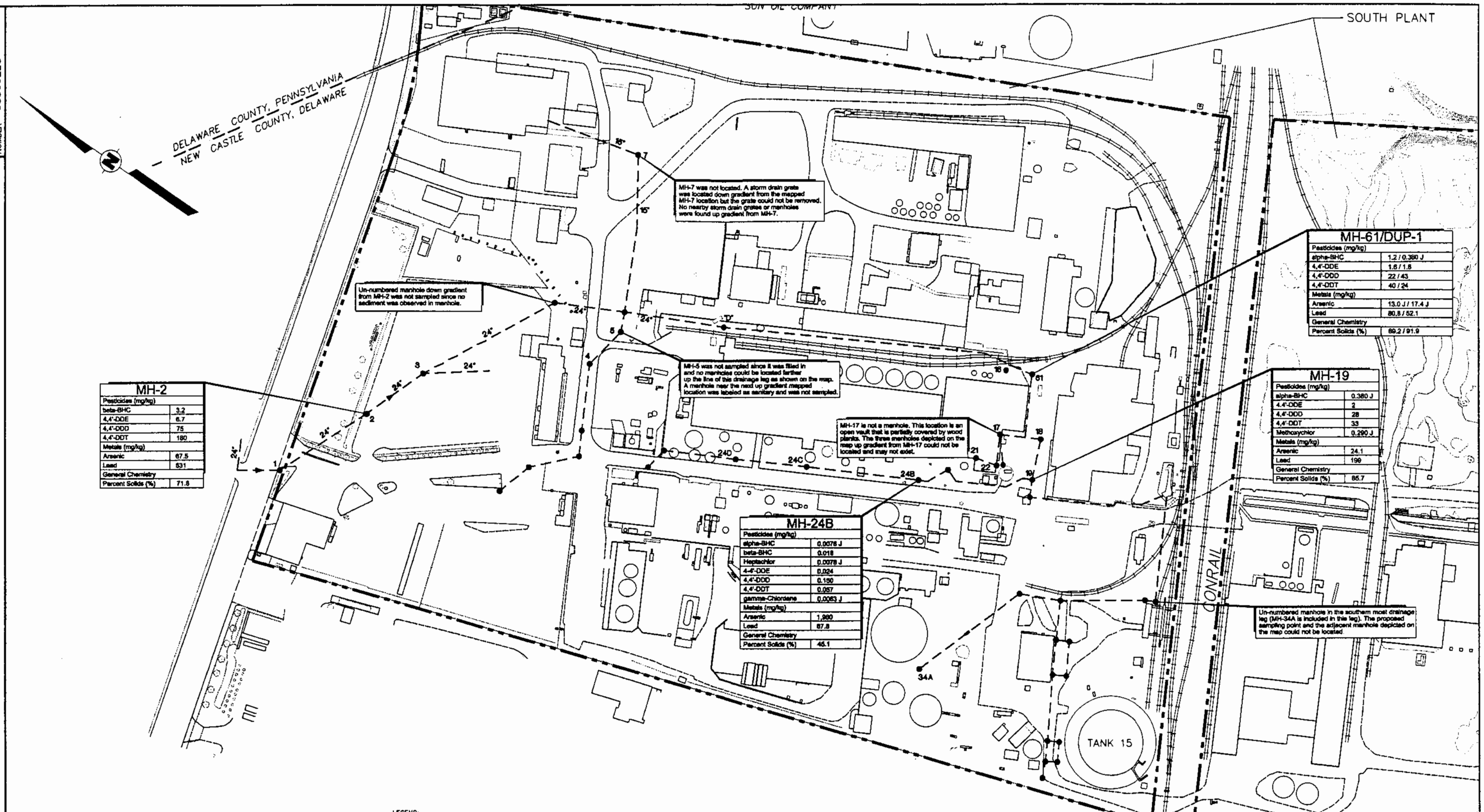
MACTEC

CUMMINGS RITER CONSULTANTS, INC.

FIGURE 3

SEDIMENT SAMPLE RESULTS SUMMARY PLAN

MACTEC Project 3485-09-0358



MH-2

Pesticides (mg/kg)	
beta-BHC	3.2
4,4'-DDE	6.7
4,4'-DDD	75
4,4'-DDT	180
Metals (mg/kg)	
Arsenic	67.5
Lead	531
General Chemistry	
Percent Solids (%)	71.8

MH-61/DUP-1

Pesticides (mg/kg)	
alpha-BHC	1.2 / 0.380 J
4,4'-DDE	1.6 / 1.8
4,4'-DDD	22 / 43
4,4'-DDT	40 / 24
Metals (mg/kg)	
Arsenic	13.0 J / 17.4 J
Lead	80.8 / 52.1
General Chemistry	
Percent Solids (%)	89.2 / 91.9

MH-19

Pesticides (mg/kg)	
alpha-BHC	0.380 J
4,4'-DDE	2
4,4'-DDD	28
4,4'-DDT	33
Methoxychlor	0.290 J
Metals (mg/kg)	
Arsenic	24.1
Lead	199
General Chemistry	
Percent Solids (%)	85.7

MH-24B

Pesticides (mg/kg)	
alpha-BHC	0.0076 J
beta-BHC	0.018
Heptachlor	0.0078 J
4,4'-DDE	0.024
4,4'-DDD	0.150
4,4'-DDT	0.057
gamma-Chlordane	0.0063 J
Metals (mg/kg)	
Arsenic	1,980
Lead	87.8
General Chemistry	
Percent Solids (%)	45.1

NOTES:

1. FACILITY GRID IS BASED ON DELAWARE STATE PLANE MERIDIAN, NAD 27.
2. ONLY DETECTED COMPOUNDS ARE LISTED.
3. SAMPLES WERE COLLECTED ON 1/20/2011.
4. "--/--" A DUPLICATE SAMPLE WAS COLLECTED AT THIS LOCATION.
5. mg/kg = MILLIGRAMS PER KILOGRAM.
6. "J" = ANALYTE PRESENT, REPORTED VALUE MAY NOT BE ACCURATE OR PRECISE.

LEGEND:

4 ● APPROXIMATE STORM SEWER MANHOLE

2 ● APPROXIMATE PROPOSED SEWER MANHOLE SAMPLE LOCATION
ONLY THE FOUR LOCATIONS WITH ILLUSTRATED DATA WERE ABLE TO BE SAMPLED.

— — — APPROXIMATE STORM SEWER LINES

▬ ▪ ▪ ▬ PROPERTY BOUNDARY

TOPOGRAPHIC CONTOURS

COMMENTS:

SAMPLED STORM SEWER LOCATIONS WERE LOCATED BY CUMMINGS/RITER CONSULTANTS, INC.
ALL OTHER INFORMATION REGARDING THE STORM SEWER SYSTEM HAS NOT BEEN VERIFIED.

REFERENCE:

1. BASE MAP TAKEN FROM EARTH SCIENCES CONSULTANTS, INC. DRAWING NO. 5465415.
2. STORM SEWER SYSTEM INFORMATION PROVIDED BY GENERAL CHEMICAL CORPORATION DRAWING NO. D-5796.

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED

CUMMINGS RITER CONSULTANTS, INC.
CORPORATE HEADQUARTERS
10 Duff Road
Duff Office Center, Suite 500
Pittsburgh, PA 15235
(412) 241-4500
Fax: (412) 241-7500

FIGURE 2

ACTIVE STORM SEWER SYSTEM SEDIMENT SAMPLING DATA

DELAWARE VALLEY WORKS (SOUTH PLANT)
CLAYMONT, DELAWARE

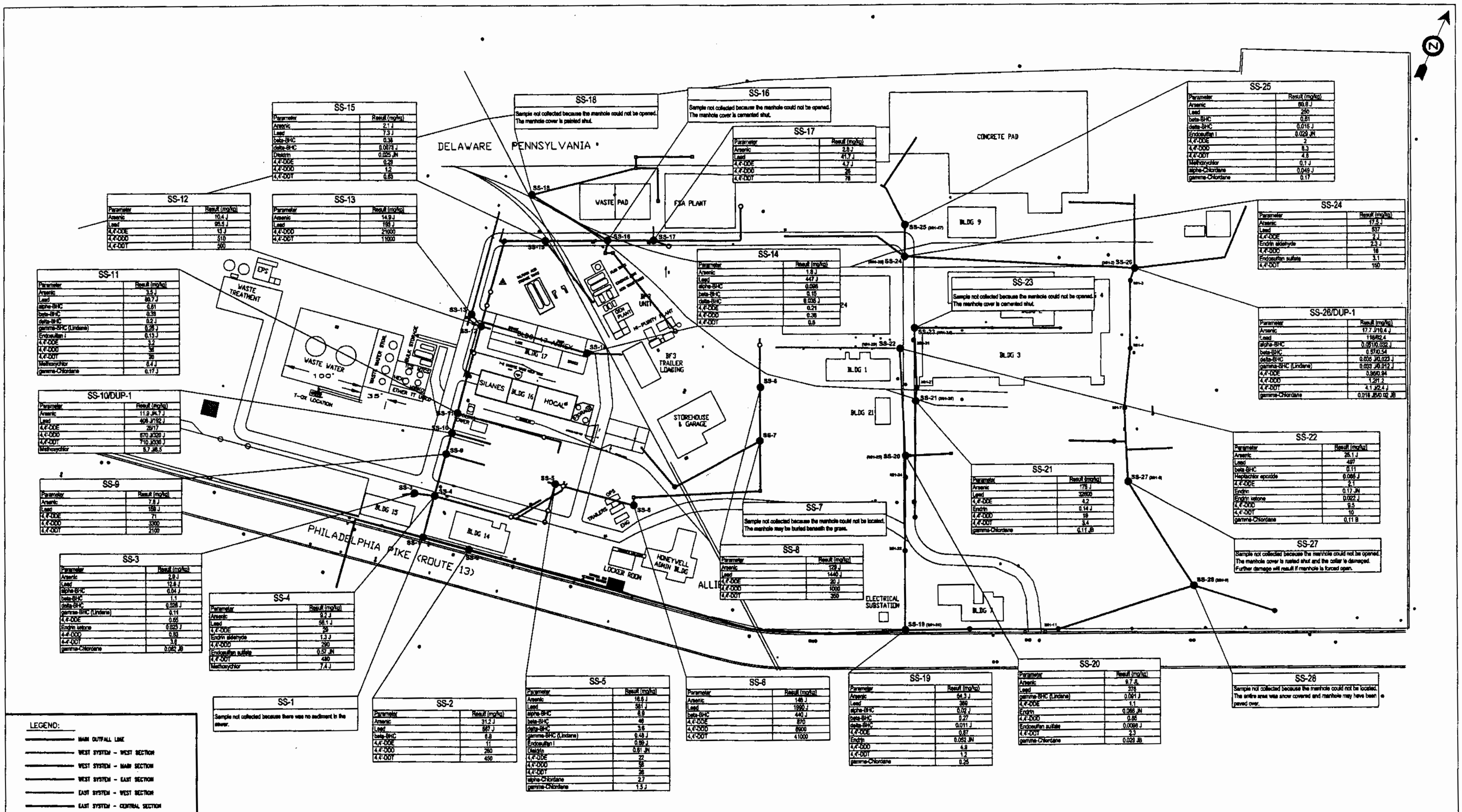
PREPARED FOR
GENTEK, INC.
PARSIPPANY, NEW JERSEY

SIZE E | SCALE: AS SHOWN | REV. – | DRAWING NUMBER 03360E28

DRAWN BY: T.N.F. / D.J.M. DATE: 11-29-10
CHECKED BY: E.M. Bubb DATE: 03-08-11
APPROVED BY: P.F. O'Hara DATE: 03-08-11

DRAWING NUMBER 03360E28

PLOT SCALE: 1=1



SS-15

Parameter	Result (mg/kg)
Arsenic	2.1 J
Lead	7.3 J
beta-BHC	0.38
delta-BHC	0.0873 J
Dieldrin	0.025 JN
4,4'-DDE	0.28
4,4'-DDD	1.2
4,4'-DDT	0.83

SS-18

Sample not collected because the manhole could not be opened. The manhole cover is painted shut.

SS-16

Sample not collected because the manhole could not be opened. The manhole cover is cemented shut.

SS-17

Parameter	Result (mg/kg)
Arsenic	2.8 J
Lead	41.7 J
4,4'-DDE	4.7 J
4,4'-DDD	26
4,4'-DDT	78

SS-25

Parameter	Result (mg/kg)
Arsenic	80.8 J
Lead	250
beta-BHC	0.61
delta-BHC	0.015 J
Endosulfan I	0.029 JN
4,4'-DDE	2
4,4'-DDD	8.3
4,4'-DDT	4.6
Methoxychlor	0.1 J
alpha-Chlordane	0.049 J
gamma-Chlordane	0.17

SS-12

Parameter	Result (mg/kg)
Arsenic	10.4 J
Lead	95.5 J
4,4'-DDE	13 J
4,4'-DDD	510
4,4'-DDT	500

SS-13

Parameter	Result (mg/kg)
Arsenic	14.9 J
Lead	193 J
4,4'-DDD	21000
4,4'-DDT	11000

SS-24

Parameter	Result (mg/kg)
Arsenic	17.5 J
Lead	537
4,4'-DDE	2 J
Endrin aldehyde	2.3 J
4,4'-DDD	16
Endosulfan sulfate	3.1
4,4'-DDT	150

SS-14

Parameter	Result (mg/kg)
Arsenic	1.8 J
Lead	447 J
alpha-BHC	0.098
beta-BHC	0.15
delta-BHC	0.035 J
4,4'-DDE	0.21
4,4'-DDD	0.38
4,4'-DDT	0.6

SS-11

Parameter	Result (mg/kg)
Arsenic	3.5 J
Lead	60.7 J
alpha-BHC	0.81
beta-BHC	0.39
delta-BHC	8.2 J
gamma-BHC (Lindane)	0.26 J
Endosulfan I	0.13 J
4,4'-DDE	3.2
4,4'-DDD	36
4,4'-DDT	26
Methoxychlor	8.4 J
gamma-Chlordane	0.17 J

SS-23

Sample not collected because the manhole could not be opened. The manhole cover is cemented shut.

SS-26/DUP-1

Parameter	Result (mg/kg)
Arsenic	17.7 J/10.4 J
Lead	118/82.4
alpha-BHC	0.051/0.032 J
beta-BHC	0.57/0.54
delta-BHC	0.035 J/0.023 J
gamma-BHC (Lindane)	0.033 J/0.012 J
4,4'-DDE	0.96/0.94
4,4'-DDD	1.2/1.2
4,4'-DDT	4.1 J/2.4 J
gamma-Chlordane	0.018 JB/0.02 JB

SS-10/DUP-1

Parameter	Result (mg/kg)
Arsenic	11.9 J/4.7 J
Lead	408 J/182 J
4,4'-DDE	29/17
4,4'-DDD	670 J/320 J
4,4'-DDT	710 J/336 J
Methoxychlor	9.7 J/8.5

SS-22

Parameter	Result (mg/kg)
Arsenic	25.1 J
Lead	497
beta-BHC	0.11
Heptachlor epoxide	0.066 J
4,4'-DDE	2.1
Endrin	0.17 JN
Endrin ketone	0.022 J
4,4'-DDD	9.5
4,4'-DDT	10
gamma-Chlordane	0.11 B

SS-21

Parameter	Result (mg/kg)
Arsenic	175 J
Lead	32800
4,4'-DDE	4.2
Endrin	0.14 J
4,4'-DDD	19
4,4'-DDT	3.4
gamma-Chlordane	0.11 JB

SS-9

Parameter	Result (mg/kg)
Arsenic	7.8 J
Lead	159 J
4,4'-DDE	71
4,4'-DDD	3300
4,4'-DDT	2100

SS-7

Sample not collected because the manhole could not be located. The manhole may be buried beneath the grass.

SS-27

Sample not collected because the manhole could not be opened. The manhole cover is rusted shut and the collar is damaged. Further damage will result if manhole is forced open.

SS-8

Parameter	Result (mg/kg)
Arsenic	129 J
Lead	1440 J
4,4'-DDE	20 J
4,4'-DDD	1000
4,4'-DDT	350

SS-3

Parameter	Result (mg/kg)
Arsenic	2.9 J
Lead	12.8 J
alpha-BHC	0.04 J
beta-BHC	1.1
delta-BHC	0.026 J
gamma-BHC (Lindane)	0.11
4,4'-DDE	0.65
Endrin ketone	0.023 J
4,4'-DDD	0.93
4,4'-DDT	3.8
gamma-Chlordane	0.062 JB

SS-4

Parameter	Result (mg/kg)
Arsenic	9.2 J
Lead	58.1 J
4,4'-DDE	29
Endrin aldehyde	1.3 J
4,4'-DDD	290
Endosulfan sulfate	0.57 JN
4,4'-DDT	480
Methoxychlor	7.4 J

SS-20

Parameter	Result (mg/kg)
Arsenic	9.7 J
Lead	376
gamma-BHC (Lindane)	0.091 J
4,4'-DDE	1.1
Endrin	0.066 JN
4,4'-DDD	0.85
Endosulfan sulfate	0.0066 J
4,4'-DDT	2.3
gamma-Chlordane	0.029 JB

SS-28

Sample not collected because the manhole could not be located. The entire area was snow covered and manhole may have been paved over.

SS-5

Parameter	Result (mg/kg)
Arsenic	16.6 J
Lead	581 J
alpha-BHC	6.9
beta-BHC	46
delta-BHC	3.6
gamma-BHC (Lindane)	0.48 J
Endosulfan I	0.59 J
Dieldrin	0.81 JN
4,4'-DDE	22
4,4'-DDD	58
4,4'-DDT	26
alpha-Chlordane	2.7
gamma-Chlordane	1.5 J

SS-6

Parameter	Result (mg/kg)
Arsenic	146 J
Lead	1890 J
beta-BHC	440 J
4,4'-DDE	870
4,4'-DDD	8900
4,4'-DDT	41000

SS-19

Parameter	Result (mg/kg)
Arsenic	54.3 J
Lead	389
alpha-BHC	0.02 J
beta-BHC	0.27
delta-BHC	0.011 J
4,4'-DDE	0.87
Endrin	0.052 JN
4,4'-DDD	4.8
4,4'-DDT	1.2
gamma-Chlordane	0.25

SS-1

Sample not collected because there was no sediment in the sewer.

SS-2

Parameter	Result (mg/kg)
Arsenic	31.2 J
Lead	667 J
beta-BHC	6.8
4,4'-DDE	11
4,4'-DDD	280
4,4'-DDT	450

LEGEND:

- MAIN OUTFALL LINE
- WEST SYSTEM - WEST SECTION
- WEST SYSTEM - MAIN SECTION
- WEST SYSTEM - EAST SECTION
- EAST SYSTEM - WEST SECTION
- EAST SYSTEM - CENTRAL SECTION
- EAST SYSTEM - EAST SECTION
- SS-1 STORM SEWER MANHOLE SAMPLE LOCATIONS
- MH-11 STORM SEWER MANHOLE LOCATION

NOTE: B INDICATES ANALYTE WAS DETECTED IN METHOD BLANK.
J INDICATES AN ESTIMATED RESULT.
L INDICATES A LOW BIAS.
N INDICATES UNCERTAINTY IN IDENTIFICATION.

0 75 150
Approximate Graphic Scale in Feet
1-inch = 75-Feet

Drawn by: MT 3/3/2011
Checked by: CJC 3/4/2011

Honeywell
CLAYMONT FACILITY - NORTH PLANT
CLAYMONT, DELAWARE

MACTEC
MACTEC Engineering and Consulting, Inc.
1787 Sentry Parkway West, Suite 120
Blue Bell, Pennsylvania 19422

FIGURE 1

JANUARY 2011 STORM SEWER SEDIMENT SAMPLING -
SAMPLE LOCATION PLAN AND SUMMARY OF ANALYTICAL RESULTS
HONEYWELL - DELAWARE VALLEY WORKS
CLAYMONT, DE

MACTEC PROJECT NO.: 3485110418

MARCH 2011

APPENDIX B

GEOTECHNICAL INVESTIGATION DATA FOR THE UPPER PORTION OF THE SLUICEWAY

CUMMINGS RITER

ANCHOR QEA

10400 Little Patuxent Parkway, Suite 220
Columbia, Maryland 21044
Phone 410.715.0824
Fax 410.715.5681
www.anchorqea.com

MEMORANDUM

To:	Steve Coladonato, Honeywell International Michael Ware, General Chemical Pat O'Hara, P.E., Cummings/Riter	**Date:**	October 31, 2011
From:	John Laplante, P.E. and Travis Merritts, Anchor QEA	**Project:**	110287-10.01
Cc:	Ram Mohan, P.E., Ph.D. and Walter Dinicola, P.E., Anchor QEA		
Re:	Geotechnical Conditions of Sluiceway Sediments, Delaware Valley Works Site, Claymont, Delaware		

This memorandum describes geotechnical conditions and provides some geotechnical engineering considerations related to surface sediments sampled from the sluiceway at the Delaware Valley Works (DVW) site in Claymont, Delaware.

BACKGROUND

The DVW site is subject to an Administrative Order (AO) with the United States Environmental Protection Agency (USEPA). Under the AO, an Interim Remedial Measure (IRM) is being conducted to address surface sediments located within a drainage sluiceway located on the site.

Alternatives considered for the sluiceway IRM include stabilizing, backfilling, capping, and removal of surface sediments. To support the evaluation of the potential alternatives, data was collected to evaluate the geotechnical characteristics of surface sediments. This memorandum discusses the results of that geotechnical characterization program.

SEDIMENT GEOTECHNICAL CHARACTERISTICS – SLUICEWAY

Sediment geotechnical characteristics in the sluiceway were evaluated through a program of soft sediment probing, in situ shear strength testing using a vane shear test (VST) device, and collection of sediment cores to facilitate laboratory geotechnical characterization testing on these sediments. The probing, VST, and sediment cores were collected at the site between September 13 and 15, 2011 by CLE Engineering (Marion, MA).

The investigation work included five probe and VST locations and one sediment core location within the sluiceway. The probe and VST locations are designated H40, H41, H42, H43, and H44. The sediment core location is referred to as SC10. A map of the exploration locations, probe logs, VST results, and laboratory test results is attached to this memorandum.

Subsurface Geotechnical Conditions

Near-surface geotechnical characteristics in the sluiceway sediment as interpreted from the probing are as follows, from the mudline downward:

Soft Silt. This layer consists of soft, dark gray elastic silt (USCS MH) and contains interbedded sand and gravel layers in certain locations. The soft silt ranges in thickness from approximately 1 to 5 feet, although the bottom contact of this unit can be transitional into a sand layer or a mixed gravel and sand/clay layer. Peak undrained shear strength ranges from approximately 7 to 350 pounds per square foot (psf) in this unit. Remolded (disturbed) undrained shear strength ranges from less than 2 to 140 psf. The soft silt unit directly overlies the gravel unit, where present, but it was not encountered at the extreme north end of the sluiceway at location H44.

Gravel. Gravel was encountered in the base on all sluiceway probes. The top of this unit ranges in elevation from -3.7 to -12.4 feet North American Vertical Datum (NAVD) 88 generally trending shallower to deeper from south to north with the exception that the shallowest contact is at the extreme north end of the sluiceway. The gravel was typically dense enough to cause probe refusal. The variation in surface elevation of the gravel may be attributable to areas of historic scour under higher flow events. The gravel unit was the deepest unit encountered in this investigation. It is assumed that the gravel unit will not be subject to remedial action under any of the proposed alternatives.

ATTACHMENT A

Probing Data, Vane Shear Data, Map of Exploration Locations, and Geotechnical Laboratory Testing Results.

ATTACHMENT A
PROBING DATA, VANE SHEAR DATA, MAP OF EXPLORATION LOCATIONS, AND GEOTECHNICAL LABORATORY TESTING RESULTS

Probe	Depth Range	Bottom Range Elevation NAVD88	Description	Date/Time
H40	0-1.4	-2.4	Water	9/15/2011 AM
	1.4-2.7	-3.7	Soft Mud (Red/Brown)	
	2.7-4	-5.0	Gravel (Refusal on Gravel)	

Probe	Depth Range	Bottom Range Elevation NAVD88	Description	Date/Time
H41	0-3.3	1.6	Water	9/15/2011 AM
	3.3-4.5	0.4	Soft Mud (Red/Brown)	
	4.5-5	-0.1	Mud	
	5-5.2	-0.3	Sand Layer	
	5.2-8.2	-3.3	Soft Mud	
	8.2-9.2	-4.3	Gravel (Refusal on Gravel)	

Probe	Depth Range	Bottom Range Elevation NAVD88	Description	Date/Time
H42	0-2	0.4	Water	9/15/2011 AM
	2-4	-1.6	Soft Mud	
	4-5	-2.6	Sand	
	5-10	-7.6	Gravel/Sand	

Probe	Depth Range	Bottom Range Elevation NAVD88	Description	Date/Time
H43	0-2.6	0.7	Water	9/15/2011 AM
	2.6-3.4	-0.1	Soft/Very soft Mud	
	3.4-12	-8.7	Gravel/Mud (Friction Refusal in Gravel/Mud)	

Probe	Depth Range	Bottom Range Elevation NAVD88	Description	Date/Time
H44	0-3.4	-0.2	Water	9/15/2011 AM
	3.4-4.1	-0.9	Gravel (Refusal on Gravel)	

CLE Engineering, Inc.

Vane Shear Test Report
Test performed on 9/15/11 by CLE Engineering, Inc.

Mud Elevation (NAVD88) =		-5
	Test #1 El=	-6
	Test #2 El=	-7
	Test #3 El=	N/A

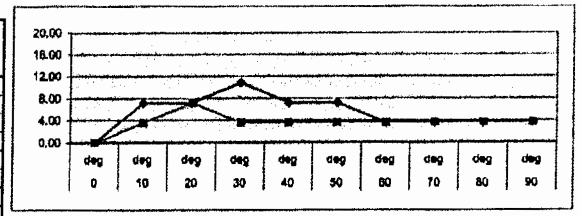
Vane Diam. = 3.810 Inches

Vane Height = 7.440 Inches

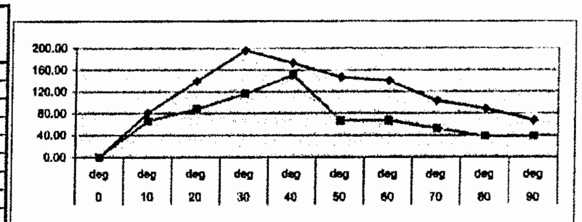
$$S_U = (T_{MAX})/\pi(0.5D^2H+0.167D^3)$$

Sample Site H40

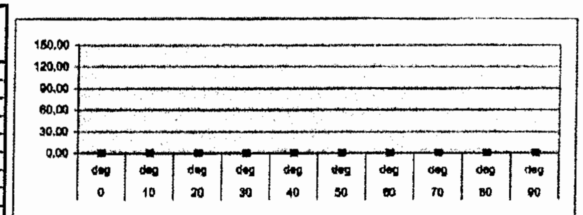
Elev. Of Test -6 Depth Below Mud 1'		Torque Inch-Pounds	Remold Torque Inch-Pounds	Shaft Correction Inch-Pounds	Net Pressure Inch-Pounds	Remolded Net Press. Inch-Pounds	Shear PSF	Remold Shear PSF
0	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
10	deg	15.0	10.0	5.0	10.0	5.0	7.25	3.62
20	deg	15.0	15.0	5.0	10.0	10.0	7.25	7.25
30	deg	20.0	10.0	5.0	15.0	5.0	10.87	3.62
40	deg	15.0	10.0	5.0	10.0	5.0	7.25	3.62
50	deg	15.0	10.0	5.0	10.0	5.0	7.25	3.62
60	deg	10.0	10.0	5.0	5.0	5.0	3.62	3.62
70	deg	10.0	10.0	5.0	5.0	5.0	3.62	3.62
80	deg	10.0	10.0	5.0	5.0	5.0	3.62	3.62
90	deg	10.0	10.0	5.0	5.0	5.0	3.62	3.62



Elev. Of Test -7 Depth Below Mud 2'		Torque Inch-Pounds	Remold Torque Inch-Pounds	Shaft Correction Inch-Pounds	Net Pressure Inch-Pounds	Remolded Net Press. Inch-Pounds	Shear PSF	Remold Shear PSF
0	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
10	deg	120.0	100.0	8.0	112.0	92.0	81.18	66.69
20	deg	200.0	130.0	8.0	192.0	122.0	139.17	88.43
30	deg	280.0	170.0	10.0	270.0	160.0	195.71	115.98
40	deg	250.0	220.0	12.0	238.0	208.0	172.51	150.77
50	deg	210.0	100.0	8.0	202.0	92.0	146.42	66.69
60	deg	200.0	100.0	8.0	192.0	92.0	139.17	66.69
70	deg	150.0	80.0	8.0	142.0	72.0	102.93	52.19
80	deg	130.0	60.0	8.0	122.0	52.0	88.43	37.69
90	deg	100.0	60.0	8.0	92.0	52.0	66.69	37.69



Elev. Of Test N/A Depth Below Mud N/A		Torque Inch-Pounds	Remold Torque Inch-Pounds	Shaft Correction Inch-Pounds	Net Pressure Inch-Pounds	Remolded Net Press. Inch-Pounds	Shear PSF	Remold Shear PSF
0	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
10	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
20	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
30	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
40	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
50	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
60	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
70	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
80	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
90	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00



CLE Engineering, Inc.

Vane Shear Test Report
Test performed on 9/15/11 by CLE Engineering, Inc.

Mud Elevation (NAVD88) = -1
Test #1 El= -2
Test #2 El= -3
Test #3 El= -4

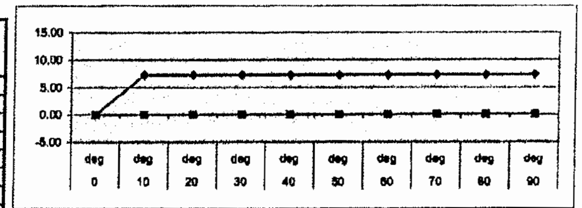
Vane Diam. = 3.810 Inches

Vane Height = 7.440 Inches

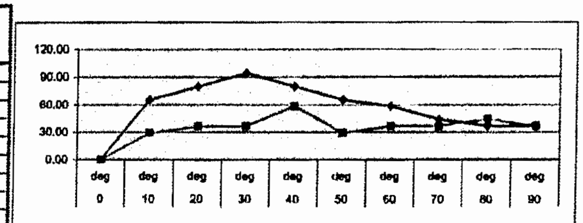
$$S_U = (T_{MAX})/\pi(0.5D^2H+0.167D^3)$$

Sample Site H41

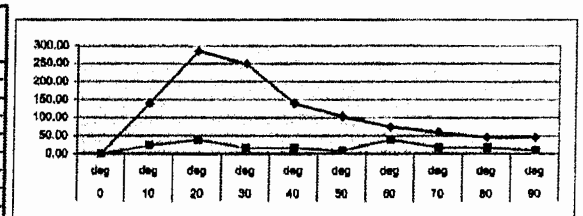
Elev. Of Test -2 / Depth Below Mud 1'		Torque Inch-Pounds	Remold Torque Inch-Pounds	Shaft Correction Inch-Pounds	Net Pressure Inch-Pounds	Remolded Net Press. Inch-Pounds	Shear PSF	Remold Shear PSF
0	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
10	deg	15.0	5.0	5.0	10.0	0.0	7.25	0.00
20	deg	15.0	5.0	5.0	10.0	0.0	7.25	0.00
30	deg	15.0	5.0	5.0	10.0	0.0	7.25	0.00
40	deg	15.0	5.0	5.0	10.0	0.0	7.25	0.00
50	deg	15.0	5.0	5.0	10.0	0.0	7.25	0.00
60	deg	15.0	5.0	5.0	10.0	0.0	7.25	0.00
70	deg	15.0	5.0	5.0	10.0	0.0	7.25	0.00
80	deg	15.0	5.0	5.0	10.0	0.0	7.25	0.00
90	deg	15.0	5.0	5.0	10.0	0.0	7.25	0.00



Elev. Of Test -3 / Depth Below Mud 2'		Torque Inch-Pounds	Remold Torque Inch-Pounds	Shaft Correction Inch-Pounds	Net Pressure Inch-Pounds	Remolded Net Press. Inch-Pounds	Shear PSF	Remold Shear PSF
0	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
10	deg	100.0	50.0	10.0	90.0	40.0	65.24	28.99
20	deg	120.0	60.0	10.0	110.0	50.0	79.73	36.24
30	deg	140.0	60.0	10.0	130.0	50.0	94.23	36.24
40	deg	120.0	90.0	10.0	110.0	80.0	79.73	57.99
50	deg	100.0	50.0	10.0	90.0	40.0	65.24	28.99
60	deg	90.0	60.0	10.0	80.0	50.0	57.99	36.24
70	deg	70.0	60.0	10.0	60.0	50.0	43.49	36.24
80	deg	60.0	70.0	10.0	50.0	60.0	36.24	43.49
90	deg	60.0	60.0	10.0	50.0	50.0	36.24	36.24



Elev. Of Test -4 / Depth Below Mud 3'		Torque Inch-Pounds	Remold Torque Inch-Pounds	Shaft Correction Inch-Pounds	Net Pressure Inch-Pounds	Remolded Net Press. Inch-Pounds	Shear PSF	Remold Shear PSF
0	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
10	deg	200.0	40.0	8.0	192.0	32.0	139.17	23.20
20	deg	400.0	60.0	8.0	392.0	52.0	284.14	37.69
30	deg	350.0	30.0	8.0	342.0	22.0	247.90	15.95
40	deg	200.0	30.0	8.0	192.0	22.0	139.17	15.95
50	deg	150.0	20.0	8.0	142.0	12.0	102.93	8.70
60	deg	110.0	60.0	8.0	102.0	52.0	73.93	37.69
70	deg	90.0	30.0	8.0	82.0	22.0	59.44	15.95
80	deg	70.0	30.0	8.0	62.0	22.0	44.94	15.95
90	deg	70.0	20.0	8.0	62.0	12.0	44.94	8.70



CLE Engineering, Inc.

Vane Shear Test Report
Test performed on 9/15/11 by CLE Engineering, Inc.

Mud Elevation (NAVD88) = -2
Test #1 El= -3
Test #2 El= -4
Test #3 El= -5

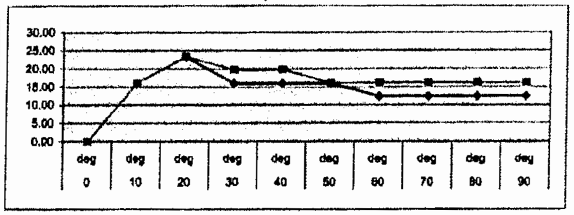
Vane Diam. = 3.810 Inches

Vane Height = 7.440 Inches

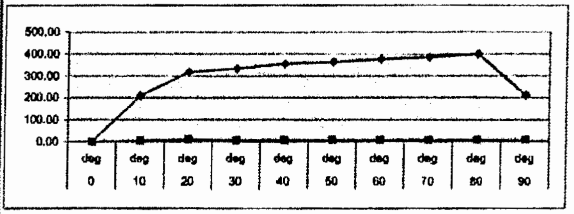
$$S_U = (T_{MAX})/\pi(0.5D^2H+0.167D^3)$$

Sample Site H42

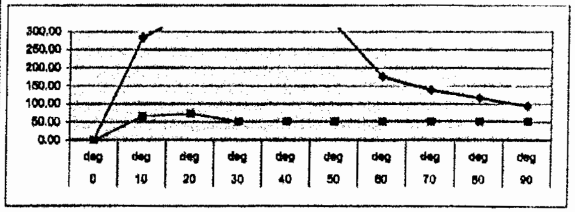
Elev. Of Test -3 / Depth Below Mud 1'		Torque Inch-Pounds	Remold Torque Inch-Pounds	Shaft Correction Inch-Pounds	Net Pressure Inch-Pounds	Remolded Net Press. Inch-Pounds	Shear PSF	Remold Shear PSF
0	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
10	deg	30.0	30.0	8.0	22.0	22.0	15.95	15.95
20	deg	40.0	40.0	8.0	32.0	32.0	23.20	23.20
30	deg	30.0	35.0	8.0	22.0	27.0	15.95	19.57
40	deg	30.0	35.0	8.0	22.0	27.0	15.95	19.57
50	deg	30.0	30.0	8.0	22.0	22.0	15.95	15.95
60	deg	25.0	30.0	8.0	17.0	22.0	12.32	15.95
70	deg	25.0	30.0	8.0	17.0	22.0	12.32	15.95
80	deg	25.0	30.0	8.0	17.0	22.0	12.32	15.95
90	deg	25.0	30.0	8.0	17.0	22.0	12.32	15.95



Elev. Of Test -4 / Depth Below Mud 2'		Torque Inch-Pounds	Remold Torque Inch-Pounds	Shaft Correction Inch-Pounds	Net Pressure Inch-Pounds	Remolded Net Press. Inch-Pounds	Shear PSF	Remold Shear PSF
0	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
10	deg	300.0	20.0	10.0	290.0	10.0	210.21	7.25
20	deg	450.0	25.0	10.0	440.0	15.0	318.93	10.87
30	deg	470.0	20.0	10.0	460.0	10.0	333.43	7.25
40	deg	500.0	20.0	10.0	490.0	10.0	355.18	7.25
50	deg	510.0	20.0	10.0	500.0	10.0	362.43	7.25
60	deg	530.0	20.0	10.0	520.0	10.0	376.92	7.25
70	deg	540.0	20.0	10.0	530.0	10.0	384.17	7.25
80	deg	560.0	20.0	10.0	550.0	10.0	398.67	7.25
90	deg	300.0	20.0	10.0	290.0	10.0	210.21	7.25



Elev. Of Test -5 / Depth Below Mud 3'		Torque Inch-Pounds	Remold Torque Inch-Pounds	Shaft Correction Inch-Pounds	Net Pressure Inch-Pounds	Remolded Net Press. Inch-Pounds	Shear PSF	Remold Shear PSF
0	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
10	deg	400.0	100.0	10.0	390.0	90.0	282.69	65.24
20	deg	500.0	110.0	10.0	490.0	100.0	355.18	72.49
30	deg	650.0	80.0	10.0	640.0	70.0	463.90	50.74
40	deg	550.0	80.0	10.0	540.0	70.0	391.42	50.74
50	deg	450.0	80.0	10.0	440.0	70.0	318.93	50.74
60	deg	250.0	80.0	10.0	240.0	70.0	173.96	50.74
70	deg	200.0	80.0	10.0	190.0	70.0	137.72	50.74
80	deg	170.0	80.0	10.0	160.0	70.0	115.98	50.74
90	deg	140.0	80.0	10.0	130.0	70.0	94.23	50.74



CLE Engineering, Inc.

Vane Shear Test Report
Test performed on 9/15/11 by CLE Engineering, Inc.

Mud Elevation (NAVD88) = -3
Test #1 El= -4
Test #2 El= -5
Test #3 El= -5.5

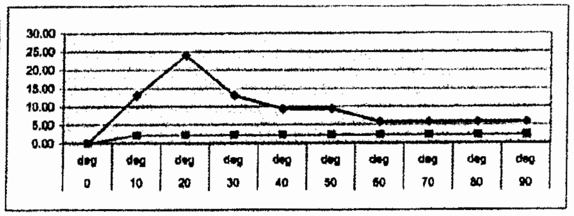
Vane Diam. = 3.810 Inches

Vane Height = 7.440 Inches

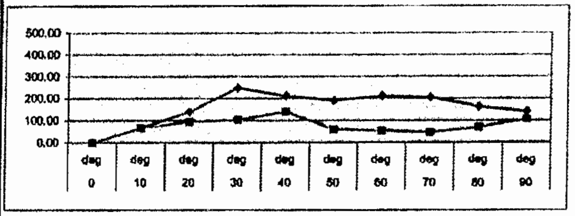
$$S_U = (T_{MAX})/\pi(0.5D^2H+0.167D^3)$$

Sample Site H43

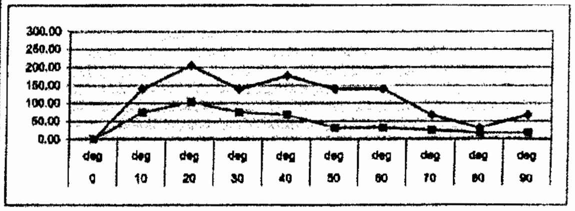
Elev. Of Test -4 Depth Below Mud 1'	Torque Inch-Pounds	Remold Torque Inch-Pounds	Shaft Correction Inch-Pounds	Net Pressure Inch-Pounds	Remolded Net Press. Inch-Pounds	Shear PSF	Remold Shear PSF
0 deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
10 deg	20.0	5.0	2.0	18.0	3.0	13.05	2.17
20 deg	35.0	5.0	2.0	33.0	3.0	23.92	2.17
30 deg	20.0	5.0	2.0	18.0	3.0	13.05	2.17
40 deg	15.0	5.0	2.0	13.0	3.0	9.42	2.17
50 deg	15.0	5.0	2.0	13.0	3.0	9.42	2.17
60 deg	10.0	5.0	2.0	8.0	3.0	5.80	2.17
70 deg	10.0	5.0	2.0	8.0	3.0	5.80	2.17
80 deg	10.0	5.0	2.0	8.0	3.0	5.80	2.17
90 deg	10.0	5.0	2.0	8.0	3.0	5.80	2.17



Elev. Of Test -5 Depth Below Mud 2'	Torque Inch-Pounds	Remold Torque Inch-Pounds	Shaft Correction Inch-Pounds	Net Pressure Inch-Pounds	Remolded Net Press. Inch-Pounds	Shear PSF	Remold Shear PSF
0 deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
10 deg	100.0	100.0	8.0	92.0	92.0	66.69	66.69
20 deg	200.0	140.0	8.0	192.0	132.0	139.17	95.68
30 deg	350.0	150.0	8.0	342.0	142.0	247.90	102.93
40 deg	300.0	200.0	8.0	292.0	192.0	211.66	139.17
50 deg	270.0	90.0	8.0	262.0	82.0	189.91	59.44
60 deg	300.0	80.0	8.0	292.0	72.0	211.66	52.19
70 deg	290.0	70.0	8.0	282.0	62.0	204.41	44.94
80 deg	230.0	100.0	8.0	222.0	92.0	160.92	66.69
90 deg	200.0	150.0	8.0	192.0	142.0	139.17	102.93



Elev. Of Test -5.5 Depth Below Mud 2.5'	Torque Inch-Pounds	Remold Torque Inch-Pounds	Shaft Correction Inch-Pounds	Net Pressure Inch-Pounds	Remolded Net Press. Inch-Pounds	Shear PSF	Remold Shear PSF
0 deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
10 deg	200.0	110.0	8.0	192.0	102.0	139.17	73.93
20 deg	290.0	150.0	8.0	282.0	142.0	204.41	102.93
30 deg	200.0	110.0	8.0	192.0	102.0	139.17	73.93
40 deg	250.0	100.0	8.0	242.0	92.0	175.41	66.69
50 deg	200.0	50.0	8.0	192.0	42.0	139.17	30.44
60 deg	200.0	50.0	8.0	192.0	42.0	139.17	30.44
70 deg	100.0	40.0	8.0	92.0	32.0	66.69	23.20
80 deg	50.0	30.0	8.0	42.0	22.0	30.44	15.95
90 deg	100.0	30.0	8.0	92.0	22.0	66.69	15.95



CLE Engineering, Inc.

Vane Shear Test Report
Test performed on 9/15/11 by CLE Engineering, Inc.

Mud Elevation (NAVD88) = -3
Test #1 El= -4
Test #2 El= n/a
Test #3 El= n/a

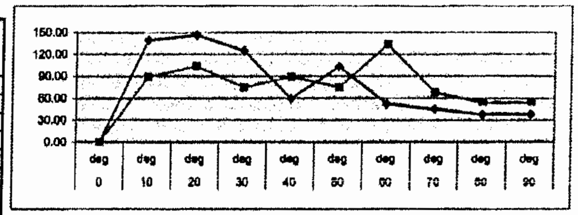
Vane Diam. = 3.810 Inches

Vane Height = 7.440 Inches

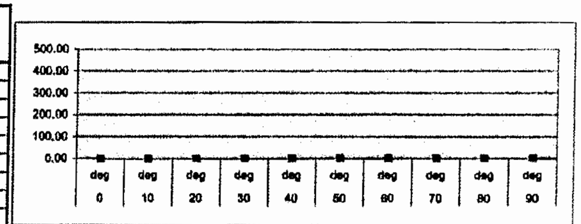
$$S_U = (T_{MAX})/\pi(0.5D^2H+0.167D^3)$$

Sample Site H44

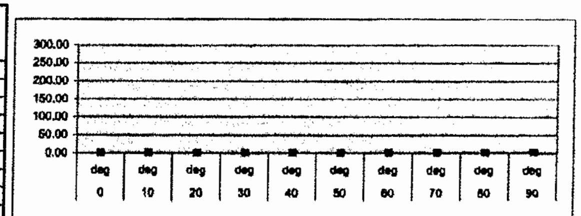
Elev. Of Test -4		Torque Inch-Pounds	Remold Torque Inch-Pounds	Shaft Correction Inch-Pounds	Net Pressure Inch-Pounds	Remolded Net Press. Inch-Pounds	Shear PSF	Remold Shear PSF
Depth Below Mud 1'								
0	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
10	deg	200.0	130.0	8.0	192.0	122.0	139.17	88.43
20	deg	210.0	150.0	8.0	202.0	142.0	146.42	102.93
30	deg	180.0	110.0	8.0	172.0	102.0	124.67	73.93
40	deg	90.0	130.0	8.0	82.0	122.0	59.44	88.43
50	deg	150.0	110.0	8.0	142.0	102.0	102.93	73.93
60	deg	80.0	190.0	8.0	72.0	182.0	52.19	131.92
70	deg	70.0	100.0	8.0	62.0	92.0	44.94	66.69
80	deg	60.0	80.0	8.0	52.0	72.0	37.69	52.19
90	deg	60.0	80.0	8.0	52.0	72.0	37.69	52.19



Elev. Of Test - n/a	N/A - Gravelly	Torque Inch-Pounds	Remold Torque Inch-Pounds	Shaft Correction Inch-Pounds	Net Pressure Inch-Pounds	Remolded Net Press. Inch-Pounds	Shear PSF	Remold Shear PSF
Depth Below Mud N/A								
0	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
10	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
20	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
30	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
40	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
50	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
60	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
70	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
80	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
90	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00



Elev. Of Test n/a	N/A - Gravelly	Torque Inch-Pounds	Remold Torque Inch-Pounds	Shaft Correction Inch-Pounds	Net Pressure Inch-Pounds	Remolded Net Press. Inch-Pounds	Shear PSF	Remold Shear PSF
Depth Below Mud N/A								
0	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
10	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
20	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
30	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
40	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
50	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
60	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
70	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
80	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00
90	deg	0.0	0.0	0.0	0.0	0.0	0.00	0.00



Exploration Locations		
Name	Easting	Northing
H25	651860.17	657138.91
H26	651907.05	657188.14
H27	652006.90	657236.54
H28	652079.48	657255.93
H29	652128.89	657297.56
H30	651847.25	657088.73
H31	651929.52	657130.30
H32	651992.66	657175.24
H33	652048.14	657186.70
H34	652155.76	657236.41
H35	652308.41	657043.27
H36	652166.38	657297.40
H37	652104.15	657397.94
H38	652035.13	657556.83
H39	651976.50	657655.75
H40	651939.07	657729.52
H41	651895.45	657808.55
H42	651848.42	657895.70
H43	651772.42	658038.05
H44	651712.42	658149.46
SC5	651883.53	657108.98
SC6	651954.54	657207.78
SC7	652125.38	657264.15
SC8	652101.38	657421.39
SC9	651990.01	657629.63
SC10	651759.36	658061.94

G1	651797.88	657141.38
G2	651936.05	657238.09
G3	652128.41	657339.03
G4	652068.90	657565.45
G5	652233.77	657217.89
G6	652352.40	657068.39
G7	652532.99	657168.30
G8	652811.85	657307.77
G9	652944.84	657391.83

SOURCE: Aerial photograph Google 2011.
HORIZONTAL DATUM: Delaware State Plane North, NAD83. U.S. Feet.
VERTICAL DATUM: Unknown.

LEGEND:

- **H1●** Hand Probe and VST Location
- **SC1** Sediment Core Location
- **G1** Proposed Geotechnical Exploration Location
- Upland Investigation Area
- In-River Investigation Area
- Proposed Survey Boundaries

0 150
Scale in Feet

ANCHOR QEA

Figure 1
Site Plan
Delaware River
Honeywell DVW

GeoTesting EXPRESS

Client:	Anchor QEA, LLC		
Project:	Claymont, DE Sediment Investigation		
Location:	---	Project No:	GTX-10512
Boring ID: ---	Sample Type: ---	Tested By:	jef
Sample ID:---	Test Date: 10/06/11	Checked By:	jdt
Depth : ---	Sample Id: ---		

Moisture Content of Soil - ASTM D 2216-05

Boring ID	Sample ID	Depth	Description	Moisture Content,%
---	SC-5	0-12 in	Moist, black sandy silt	56.9
---	SC-5	12-24 in	Wet, black silt	92.6
---	SC-5	24-36 in	Wet, very dark gray silt	86.8
---	SC-5	36-42 in	Wet, very dark grayish brown silt with sand	96.7
---	SC-6	0-12 in	Wet, black silt with sand	71.3
---	SC-7	0-12 in	Wet, black silt	75
---	SC-8	0-12 in	Moist, black silty sand with gravel	83.6
---	SC-9	0-12 in	Wet, dark yellowish brown sandy silt	254.1
---	SC-10	0-12 in	Wet, dark gray silt	921.9

Notes: Temperature of Drying : 110° Celsius

GeoTesting
EXPRESS

Client: Anchor QEA, LLC			
Project: Claymont, DE Sediment Investigation			
Location: ---		Project No:	GTX-10512
Boring ID: ---	Sample Type: ---	Tested By:	ema
Sample ID:---	Test Date: 10/04/11	Checked By:	jdt
Depth : ---	Test Id: 218213		

Specific Gravity of Soils by ASTM D 854-06

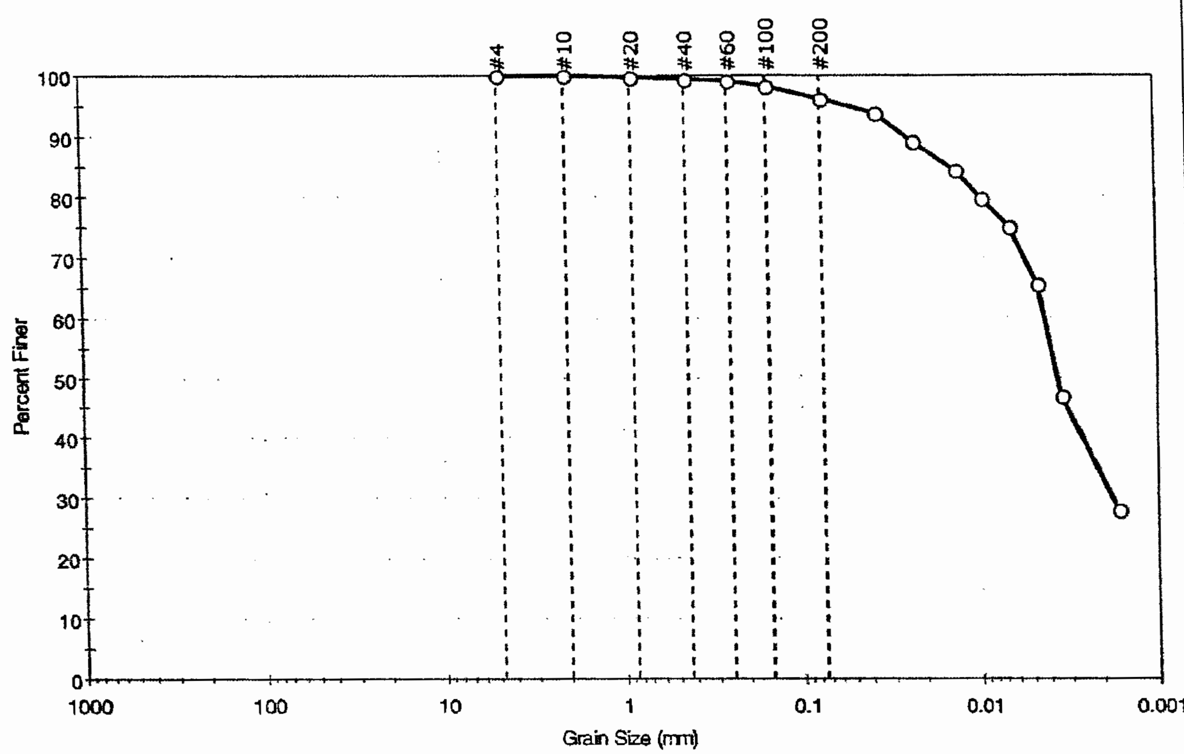
Boring ID	Sample ID	Depth	Visual Description	Specific Gravity
---	SC-5	0-12 in	Moist, black sandy silt	2.79
---	SC-5	24-36 in	Wet, very dark gray silt	2.54
---	SC-6	0-12 in	Wet, black silt with sand	2.86
---	SC-8	0-12 in	Moist, black silty sand with gravel	2.76
---	SC-10	0-12 in	Wet, dark gray silt	2.76

Moisture Content determined by ASTM D 2216.

GeoTesting EXPRESS

Client:	Anchor QEA, LLC				
Project:	Claymont, DE Sediment Investigation				
Location:	---			Project No:	GTX-10512
Boring ID: ---		Sample Type:	bag	Tested By:	jbr
Sample ID: SC-10		Test Date:	09/29/11	Checked By:	jdt
Depth : 0-12 in		Test Id:	218188		
Test Comment:	---				
Sample Description:	Wet, dark gray silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	3.9	96.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	99		
#100	0.15	98		
#200	0.075	96		
---	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0370	94		
---	0.0230	89		
---	0.0133	84		
---	0.0094	80		
---	0.0067	75		
---	0.0046	66		
---	0.0034	47		
---	0.0016	28		

Coefficients

D_{85} = 0.0143 mm — D_{30} = 0.0018 mm

D_{60} = 0.0042 mm — D_{15} = N/A

D_{50} = 0.0036 mm — D_{10} = N/A

C_u = N/A — C_c = N/A

Classification

ASTM — elastic silt (MH)

AASHTO — Clayey Soils (A-7-5 (195))

Sample/Test Description

Sand/Gravel Particle Shape : ---

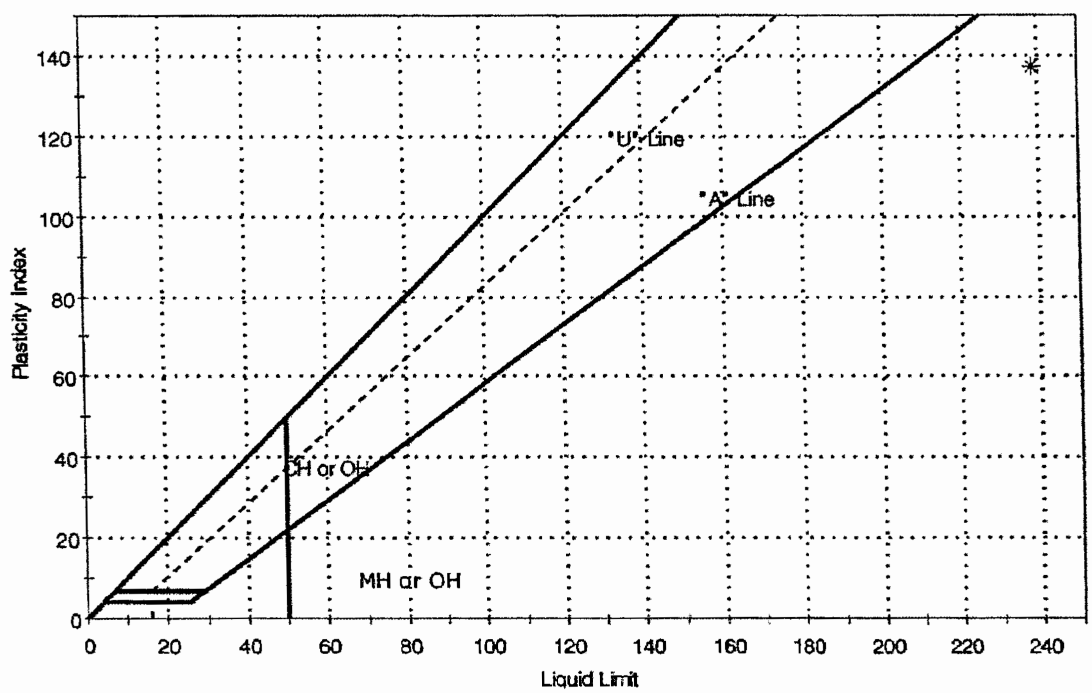
Sand/Gravel Hardness : ---

printed 10/6/2011 10:43:07 AM

GeoTesting EXPRESS

Client:	Anchor QEA, LLC		
Project:	Claymont, DE Sediment Investigation		
Location:	---	Project No:	GTX-10512
Boring ID: ---	Sample Type: bag	Tested By:	GA
Sample ID:SC-10	Test Date: 10/06/11	Checked By:	jdt
Depth : 0-12 in	Test Id: 218195		
Test Comment:	---		
Sample Description:	Wet, dark gray silt		
Sample Comment:	---		

Atterberg Limits - ASTM D 4318-05



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
*	SC-10	---	0-12 in	922	239	102	137	6	elastic silt (MH)

Sample Prepared using the WET method

1% Retained on #40 Sieve

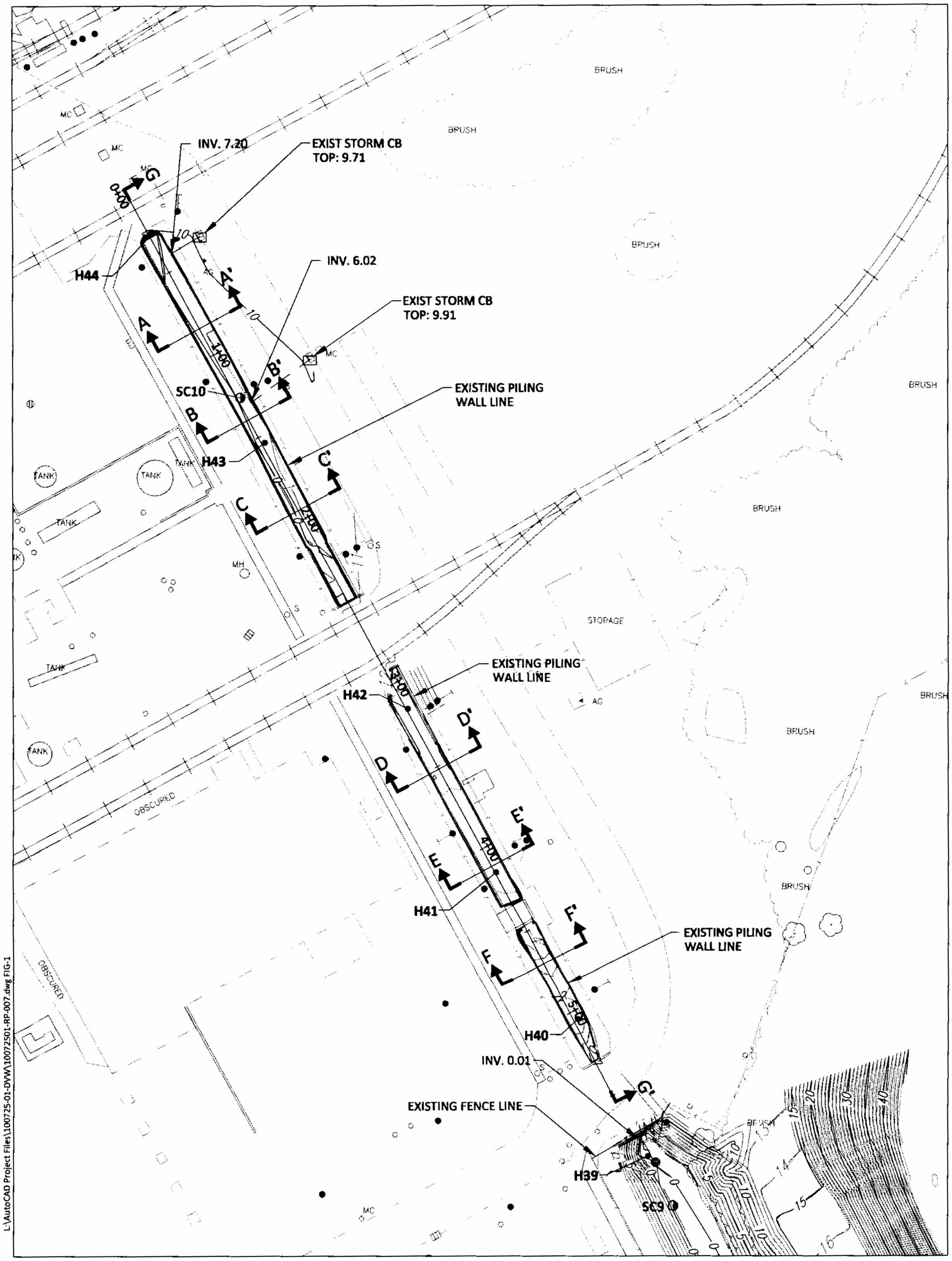
Dry Strength: MEDIUM

Dilentancy: NONE

Toughness: MEDIUM

APPENDIX C

TOPOGRAPHIC INFORMATION FOR THE UPPER PORTION OF THE SLUICEWAY



L:\AutoCAD Project Files\100725-01-DVW\10072501-RP-007.dwg FIG-1

Mar 06, 2012 9:00am ghowell

SOURCE: Topographic survey from CLE Engineering, Inc. Dated October 10, 2011
HORIZONTAL DATUM: Delaware State Plane North, NAD83. U.S. Feet.
VERTICAL DATUM: NAVD 88

LEGEND:

H1 ● Hand Probe and VST Location

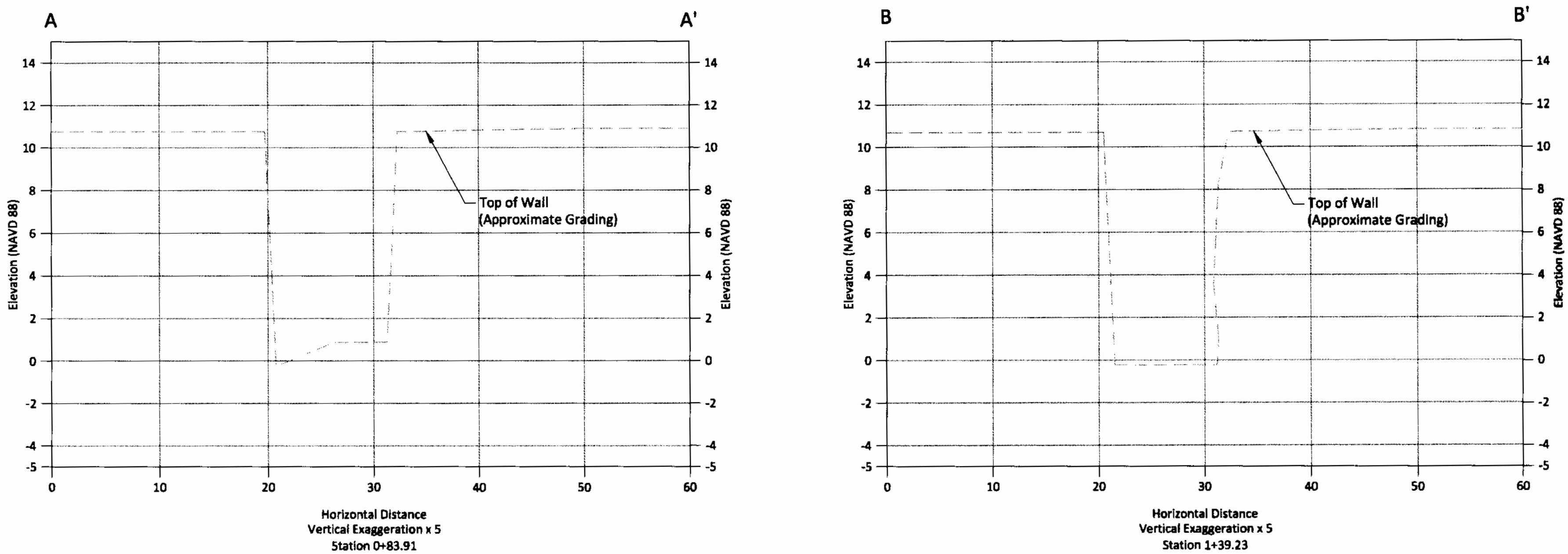
SC1 ◐ Sediment Core Location

G1 Proposed Geotechnical Exploration Location

0 50
Scale in Feet

ANCHOR QEA

Figure 1
Site Plan
Delaware River
Honeywell DVW



L:\AutoCAD Project Files\100725-01-DVW\10072501-RP-007.dwg FIG-XSEC-2

Mar 06, 2012 9:01am ghowell

SOURCE: Topographic survey from CLE Engineering, Inc. Dated October 10, 2011.
HORIZONTAL DATUM: Delaware State Plane North, NAD83. U.S. Feet.
VERTICAL DATUM: NAVD 88

NOTE:
1. Survey data represents bottom of bank elevations as measured approximately 12" from the edge of sluiceway sheet pile wall.
2. Hand probes generally performed near the center of the sluiceway channel.

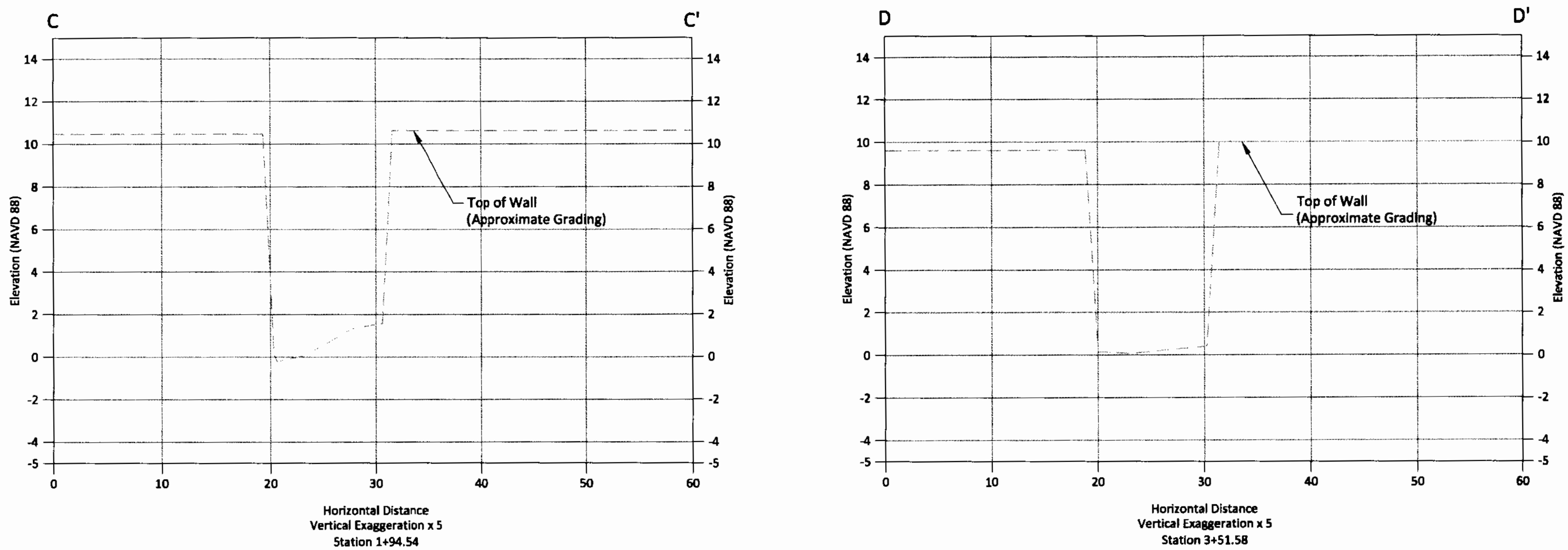
LEGEND:

— — — Bottom profile surveyed by Landmark JCM (September 2011)

0 10
Scale in Feet

ANCHOR QEA

Figure 2
Sections A-A' and B-B'
Delaware River
Honeywell DVW



SOURCE: Topographic survey from CLE Engineering, Inc. Dated October 10, 2011.
HORIZONTAL DATUM: Delaware State Plane North, NAD83. U.S. Feet.
VERTICAL DATUM: NAVD 88

NOTE:
1. Survey data represents bottom of bank elevations as measured approximately 12" from the edge of sluiceway sheet pile wall.
2. Hand probes generally performed near the center of the sluiceway channel.

LEGEND:

— — — Bottom profile surveyed by Landmark JCM (September 2011)

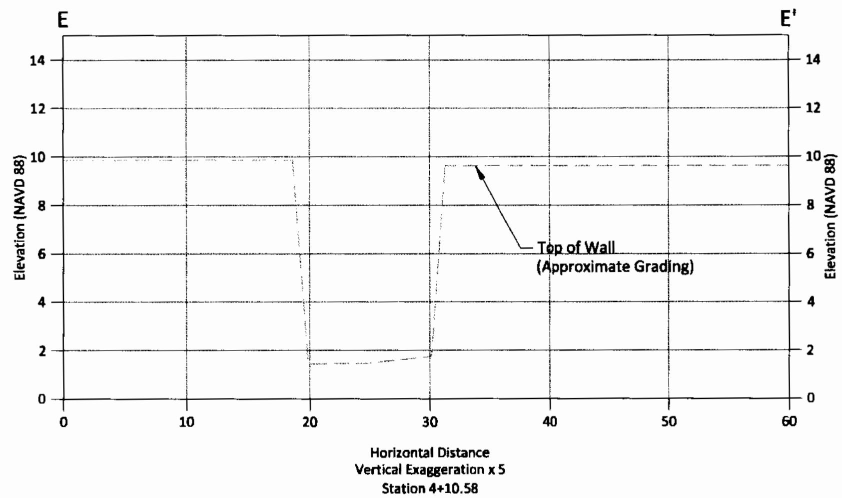
0 10
Scale in Feet

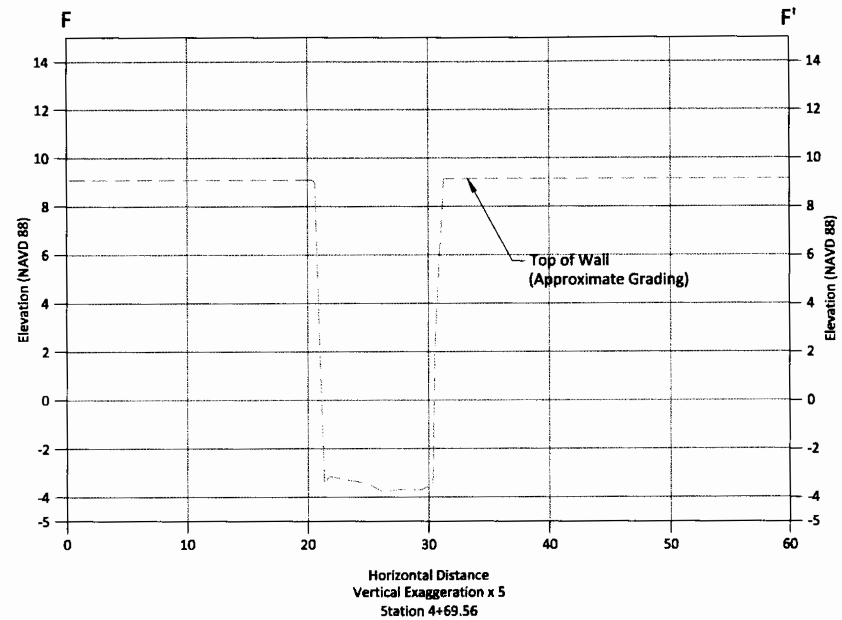
L:\AutoCAD Project Files\100725-01-DVW\10072501-RP-007.dwg FIG-XSEC-3

Mar 06, 2012 9:01am ghowell

ANCHOR QEA

Figure 3
Sections C-C' and D-D'
Delaware River
Honeywell DVW





SOURCE: Topographic survey from CLE Engineering, Inc. Dated October 10, 2011.
HORIZONTAL DATUM: Delaware State Plane North, NAD83. U.S. Feet.
VERTICAL DATUM: NAVD 88

NOTE:
1. Survey data represents bottom of bank elevations as measured approximately 12" from the edge of sluiceway sheet pile wall.
2. Hand probes generally performed near the center of the sluiceway channel.

LEGEND:

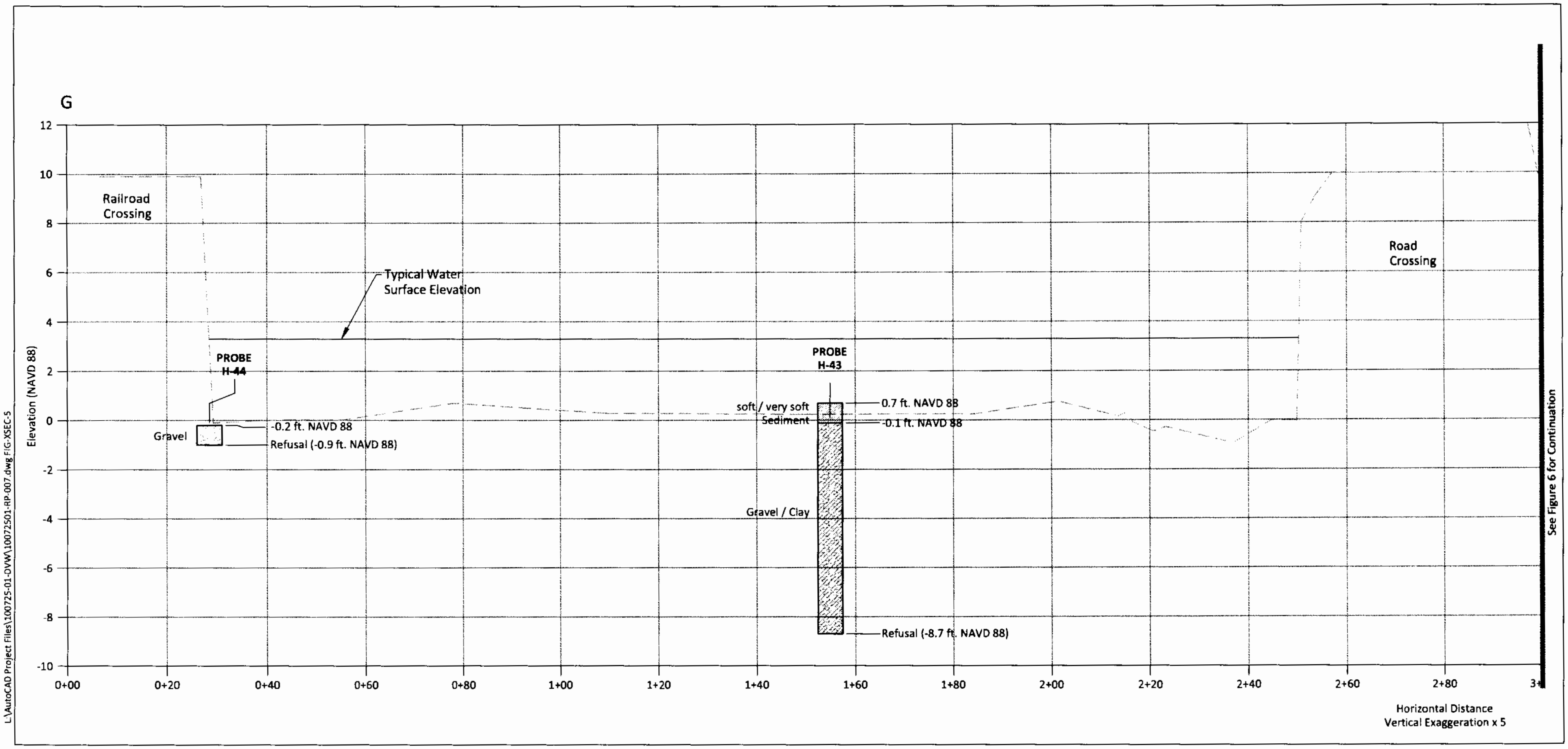
Bottom profile surveyed by Landmark JCM (September 2011)

0 10
Scale in Feet

Mar 06, 2012 9:02am ghowell

ANCHOR QEA

Figure 4
Sections E-E' and F-F'
Delaware River
Honeywell DVW



L:\AutoCAD Project Files\100725-01-DVW\10072501-RP-007.dwg FIG-XSEC-5

Mar 06, 2012 9:02am ghowell

SOURCE: Topographic survey from CLE Engineering, Inc. Dated October 10, 2011
HORIZONTAL DATUM: Delaware State Plane North, NAD83. U.S. Feet.
VERTICAL DATUM: NAVD 88

NOTE:
1. Survey data represents bottom of bank elevations as measured approximately 12" from the edge of sluiceway sheet pile wall.
2. Hand probes generally performed near the center of the sluiceway channel.

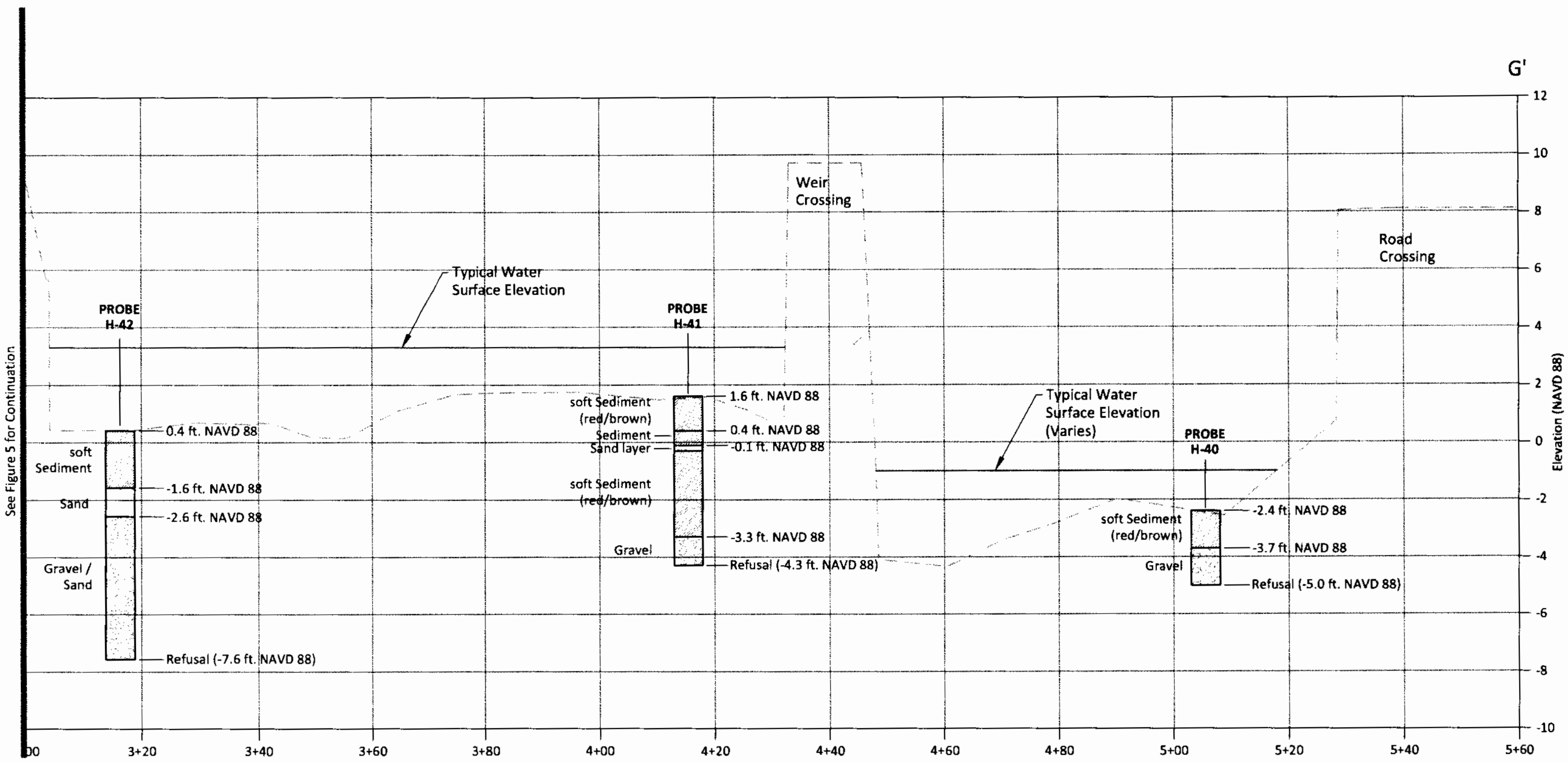
LEGEND:

Bottom profile surveyed by Landmark JCM (September 2011)

0 20
Scale in Feet

ANCHOR QEA

Figure 5
Section G-G'
Delaware River
Honeywell DVW



L:\AutoCAD Project Files\100725-01-DVW\10072501-RP-007.dwg FIG-XSEC-6

Mar 06, 2012 9:03am ghowell

SOURCE: Topographic survey from CLE Engineering, Inc. Dated October 10, 2011
HORIZONTAL DATUM: Delaware State Plane North, NAD83. U.S. Feet.
VERTICAL DATUM: NAVD 88

NOTE:
1. Survey data represents bottom of bank elevations as measured approximately 12" from the edge of sluiceway sheet pile wall.
2. Hand probes generally performed near the center of the sluiceway channel.

LEGEND:

Bottom profile surveyed by Landmark JCM (September 2011)

0 20
Scale in Feet

ANCHOR QEA

Figure 6
Section G-G'
Delaware River
Honeywell DVW